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Power, Science, and Public Lighting

THE second conference season of the year opens next week; that of June and July has now passed into history. Which is to be considered the most important event of the three, of which we give a forecast in this issue, depends upon the point of view.

To the internationally minded and those who are concerned with large-scale planning, the World Power Conference at Washington undoubtedly takes first place. The papers which are to be presented provide a collection of data relating to the potentialities and actual development of power resources which could not easily be obtained in any other way. They will form a small reference library which should be of great utility until at least the time of the next conference, probably six years hence.

Most of the principal countries of the world are contributing to the conference, although it must be confessed that there are one or two rather important omissions. For instance, there is no paper from Italy, a leader in hydro-electric development, although there are Italian contributions to the concurrent Congress on Large Dams. Sweden, whose large water-power projects are most interesting, is content with a paper on the utilisation of small water powers and one on gas production and distribution.

Great Britain is represented in six out of the seven sections, the authors including such well-known electrical men as Messrs. W. B. Woodhouse, H. C. Lamb, J. C. Dalton, H. Hobson, S. E. Britton, J. R. Beard and H. Quigley. Their papers cover this country's power resources, the organisation of publicly owned and private electricity supply undertakings, and rural electrification.

The last of these subjects is receiving a great deal of attention. Apart from Mr. Britton's paper on what is being done in Great Britain, there are contributions on the subject from Hungary, Denmark, Holland, France, Germany, Czechoslovakia, Switzerland, Belgium, the United States and Austria. The interchange of experiences in this field should prove of considerable value in advancing this important development.

The British Association meeting at Blackpool, although for the "advancement of science," must not be considered as a mere academic gathering. Some eminently practical papers are being presented.

As we have already stated, an effort is being made to relate the proceedings to the ordinary everyday life of the community. For example, Dr. W. Cramp's address as President of the Engineering Section, will deal with the engineer's rôle in the national scheme. He will, no doubt, suggest how the engineer can fit himself to fulfil his obligations to the community in the most thoroughgoing manner. The title of a paper which Dr. C. C. Garrard is to read in the same Section, "The Economic Incentive of the Engineer," suggests that the complementary subject—the community's duty to the engineer—will also be considered.

The Physics and Chemistry Sections include several papers of an electrical character in their proceedings. Of particular and practical interest is a symposium on electro-plating in the Chemistry Section, in connection with which a display will be arranged by the Electro-depositors' Technical Society.

The recent report of the Ministry of Transport Committee on road lighting has given added prominence to the work and conference of the Association of Public Lighting Engineers. With a better recognition of the fact that public lighting is not merely a matter of small pools of brightness at infrequent intervals, so as not to strain the rate-fund too much, the A.P.L.E. should soon come into its own. Several useful papers are being read and discussed at the conference, and the comprehensive exhibition of equipment should be of great educational value.

The Radio Show

IN the absence of any revolutionary changes in the design of broadcasting receivers, public interest in "Radiolympia" has centred upon the television demonstrations arranged by eight manufacturers of apparatus. Most visitors, however, will have to remain content with this glimpse of the new art for a very long time; the prices which have been announced so far place television receivers well beyond the reach of the masses. Yet who knows what limits there are to the hire-purchase system? Some very small valves, about the size of large acorns and named after this fruit, have made their appearance. These will, no doubt, aid in the production of "bijou" sets, although midget valves of an earlier type did not seem to catch on. The usual ingenuity in cabinet-making is again exemplified and a host of designs, beautiful and bizarre, compete for the public's attention and money. The home constructor is not catered for so well as in earlier shows. The pursuit of this fascinating hobby has been rendered more and more difficult with the advance in technique and its consequent complications. There used to be listeners and constructors—two distinct classes—but now the majority buy their sets ready made.

Grimsby Station Selected

THE amendment of the Mid-East England Electricity Scheme which was published on Tuesday by the Central Electricity Board covers the alteration in the routes of transmission lines found desirable in constructing the grid. It also provides for the selection of the Moss Road generating station, Grimsby, which was previously scheduled for temporary operation only. Since the original scheme of the Electricity Commissioners was adopted, early in 1929, two 10,000-kW turbo-alternators have been installed, with beneficial results in working economy. Although the capacity of these sets is not great judged by present-day standards, they provide another example of the improvement that can be effected by installing modern plant on a suitable site. As Fulham is the only new capital station under way (and this is to be brought into service this month), and sites with ample supplies of condensing water are not to be found everywhere, much of the growth of load for some time ahead will no doubt be dealt with by substituting larger and more economical sets for older units.

Is Radio Lighting?

THE Bridgend U.D.C. has warned its electricity consumers that they will be prosecuted if they run their radio sets off the power circuit. We suppose that if the Council has laid down a rate for lighting and radio supplies it is in order in enforcing it, but we seriously question the logic or the desirability of such a step. The lighting rate is high on account of its low diversity and load factors, and can be justified, but the character of the radio-set load is very different. And there seems to be no reason for treating the dull glow of radio valves as lighting even in Aberdeen. A daily paper reports a Central Board "official" (blessed word!) as saying that "a municipal authority would be justified in classifying wireless as lighting because it is a luxury article." This, if it means anything at all, implies that electric lighting is a superfluity. Does this nebulous official retire at sunset or sit in darkness all the evening? If electric lighting is a luxury, farthing dips would be sheer extravagance.

Distribution Losses

WHILE there may be no method of computing the efficiency of a distribution system to compare with that provided by overall thermal efficiency for a generating station, the need to keep at least as careful a record of losses on the network outside is obvious. In his practical analysis of losses incurred in distribution, included in this issue, Mr. D. P. Sayers shows how various are the factors of which a methodical account should be kept. He shows that transformers are usually responsible for quite half the total losses, which somewhat simplifies the issue, and that their individual load factors are in most cases far below that of the system as a whole. While this appears to point to the importance of reducing iron losses, at the expense of copper losses, recent investigations have drawn attention to an aspect that may easily be overlooked. Care has to be exercised that the value of securing the best technical balance of iron and copper losses is not depreciated by reduced revenue due to slightly poorer voltage regulation.

From Gas to Electricity

SUCH spectacular street lighting conversions as those in Birmingham and Camberwell are not practicable everywhere. Nevertheless, there is a good deal of evidence to show that a systematic change from gas to electricity is going on in many towns. The latest street lighting report that we have received (from Liverpool) records an increase of 31 miles in the streets electrically illuminated, while those lighted by gas were reduced by 16 miles. Mr. P. J. Robinson, who is the city lighting engineer as well as the city electrical engineer, produces figures which fully justify this policy. Taking candle-power per annum as the unit, he shows that electricity cost 2.93d. and gas 3.76d. These figures, of course, apply only to Liverpool, where the average price of electricity for street lighting last year was 1.095d. per kWh and that of gas 2s. 4.12d. per 1,000 cu. ft. It is, however, of general value to learn that Mr. Robinson finds the operating costs of a modern electric street lighting installation, including weekly cleaning and replacement of lamps, to be 11.8 per cent. less than in the case of the most efficient gas installation, including cleaning and the replacement of mantles.

Cheap Steam

IN the Witbank district of the Electricity Supply Commission of South Africa electricity is supplied at an average price of less than 0.115d. per kWh. The moderate claim made in the annual report of the Commission, which is reviewed on a later page, that the charges in the area are amongst the lowest in the world could have taken a more ambitious form had the qualification "coal-fired" been inserted. Since water-power is the obvious comparison, the danger of drawing generalised inferences may be illustrated by another station of the Commission—the hydro-electric plant at Sabie, where the overall cost per kWh sold is 0.434d., although the load factor is similar to that of Witbank. Sabie, however, has an installed capacity of only 1,350 kW (against Witbank's 100,000 kW) and the capital charges incurred in making use of the water are high. Coal is obtainable at Witbank at 2s. 3d. per short ton (2,000 lb.), but if it were 30s. per ton energy could still be sold more cheaply than that from Sabie.

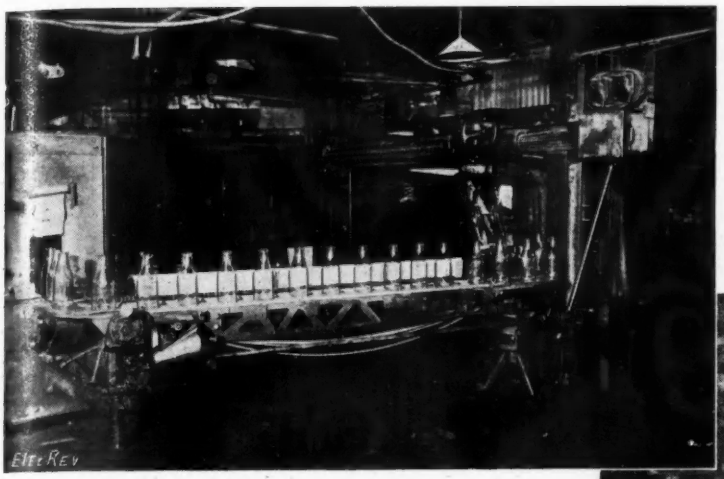
The Small Undertakings

SINCE the McGowan Committee's report was published much consternation has been expressed on behalf of the undertakings with annual outputs below 10 million kWh which the Committee recommended should be merged in larger undertakings where possible. The engineers of some of these undertakings have questioned whether the Council of the I.M.E.A. has given due consideration to the probable plight of some of the Association's less prominent members. These engineers may derive some comfort from statements made in two places in the editorial notes of the Association's official journal for September. In one note it is said that the Council

> "are fully aware of the views of the 'small' undertakings and, in the event of any scheme or schemes, or legislation being propounded, the same will be given very careful scrutiny by the Council."

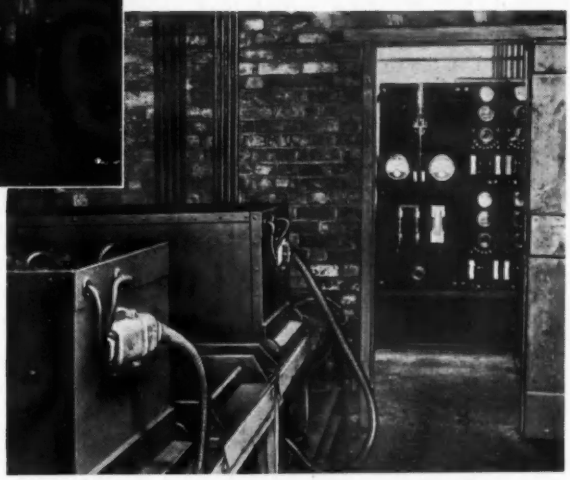
In the second place it is stated:

> "Members, particularly the 'small' members, may rest assured that the Council are fully alive to the whole position, and necessary action will be taken at the appropriate moment in order to ensure that due consideration is given to the undertakings embodied in the membership of the Association."



Glass Bottle Manufacture

Electrical aspects and a general description of the processes at a large works at Charlton



Left: Automatic loader between furnace and lehr. Right: Battery charging station; platform in foreground, machine house at rear

SAND, lime, soda ash and cullet (broken glass) are the raw materials for the manufacture of glass bottles at the Charlton works of the United Glass Bottle Manufacturers, Ltd., which we recently visited. The greater part of these materials (batch) is water-borne to the works and delivered at a jetty which will accommodate up to 2,000-ton boats and on which we saw two electric cranes. The raw materials are transported from the jetty in the company's own railway trucks, and as many as 120 of these trucks also provide for mobile storage.

The sand, which is of a special iron-free kind received from abroad, first has its moisture content reduced to about 2 per cent. This is effected in a revolving horizontal-cylinder type coke-fired dryer with a capacity of 7 tons per hr. and driven by a 35-h.p. motor. For storage immediately before manufacture there are six 600-ton ferro-concrete bins (silos); from the railway trucks the materials are delivered to the top of the bins by a 40-ton per hr. bucket elevator driven by a 20-h.p. motor. This elevator feeds two screw conveyors along the top of the bins to which they distribute the material as required. Each screw has a 5-h.p. drive.

Under the bins is a small electric railway system complete with track and overhead conductors for electricity distribution and feeding by sliding contact. This railway accommodates a 25-cwt. batch car equipped with a 10-h.p., 240-V d.c. motor with a tramway-type controller. *Via* valves at the bottom of the bins batch falls into the car below, being automatically weighed in the car and then delivered to mixing equipment.

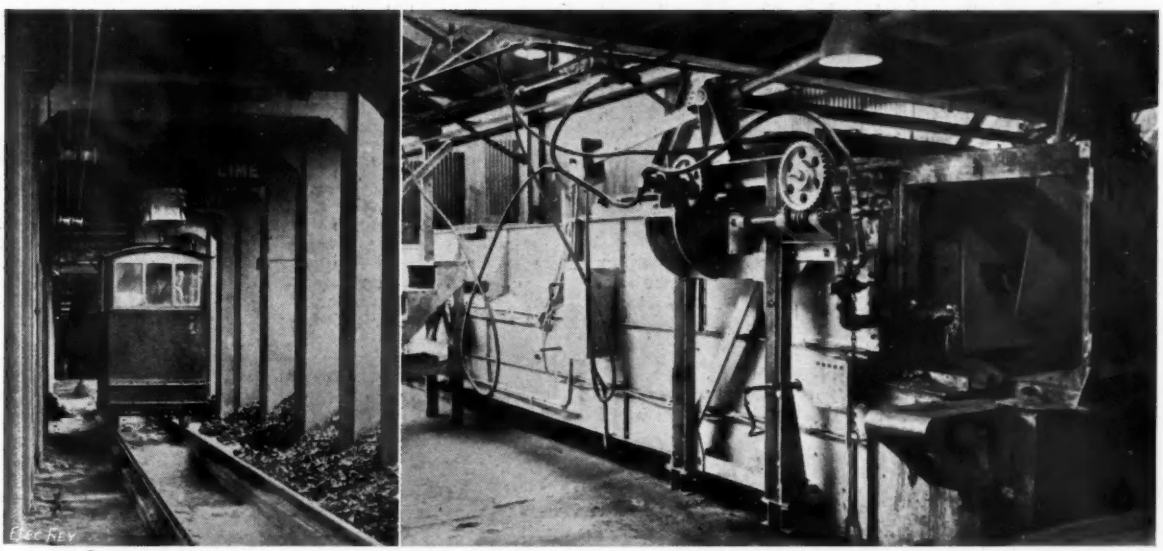
This is a rotary-type mixer working on similar lines to ordinary concrete-mixing machines. The mixed batch is elevated to another storage bin the bottom of which is about 30 ft. above ground level, and on another electric railway immediately below this mixed-batch bin a similar car receives the mixed material.

The elevated track is above the 25-ton feeding hoppers of oil-fired furnaces, and the car delivers its load into these hoppers which, in turn, supply the material to mechanical batch feeders, each of which has a screw conveyor with a 2½-h.p. motor and a P.I.V. drive, and under the screw is a compressed-air operated pusher. Batch is fed to the forehearth of the furnace by the screw, a pile of the material being gradually built up to a convenient size. This pile is then transferred by the pusher to a position inside the furnace where it is subjected to the full furnace radiation while a second pile is built up in its first position.

When the pusher deals similarly with the second pile, the first pile, now practically at melting point, is pushed further into the furnace by the second pile. The furnaces, each of which has an output of about 50 tons per day, are oil-fired (1,500 degrees C.) on the reversible regenerative principle.

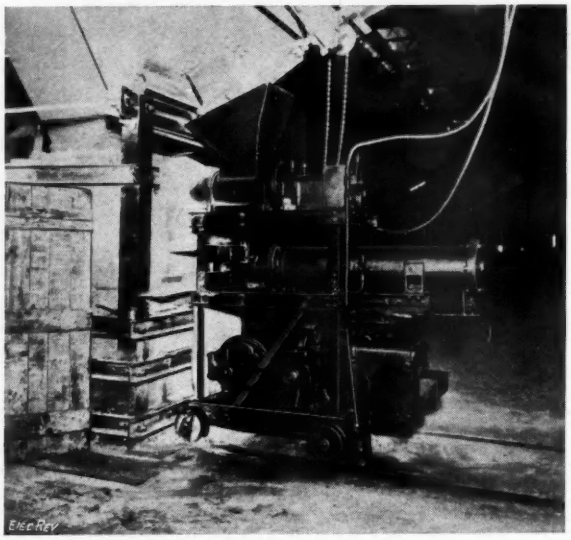
There is a row of oil burners just above the air-inlet and waste-gas outlet ports and a brick regenerative chamber at each side of the furnace below the floor level and connected to the furnace by the above mentioned ports. The burners at one side only are in operation for about 30 min., during which time the hot gases pass into the brick chamber at the other side of the furnace. During the next 20 min., when the burners on the other side are in operation, the air required for combustion is drawn through the preheated chamber on the firing side.

On either side at the refining end of each furnace is a revolv-



Left: Electric railway and batch car under storage bins. Right: A lehr viewed from the feeding end.

ing pan, about 10 ft. in diameter and 10 in. deep, into which the molten glass is delivered. Each pan is supported on the end of a vertical driving shaft which, in turn, is supported on a roller bearing and is gear driven by a motor situated about eight feet below the pan. We were told that a change recently from a d.c. drive to an a.c. one incorporating P.I.V. reducing gear and speed change has resulted in a great improvement in the precision of the speed regulation. Actual formation of the glass vessels is effected in ten-head Owen's machines, each head being a self-contained moulding unit. The heads pass over an exposed portion of the pot and at the correct moment each head dips into the molten glass and sucks up a portion of glass into the parison mould. This mould comprises two halves on rams which open out during the journey round the machine, leaving the plastic material suspended by the neck for a few seconds for cooling and transferring it to the blow mould. This second mould then closes



A furnace batch charger

around the parison and compressed air at 15 lb. per sq. in. is admitted through the centre of the parison, thus blowing the plastic glass to the shape of the blow mould which remains in position long enough to set the glass. The blow mould then opens and delivers its formed bottle to a chute from which it is delivered to the annealing lehrs. For the suction and blowing operations on the glass machines there is a comprehensive range of both steam and electric air compressors and vacuum pumps. There are two air compressors of 1,650-cu. ft. each, one of 2,200-cu. ft. connected to a 250-h.p. s.r. induction motor and two of 250 cu. ft. driven by a 60-h.p. induction motor. There are also two vacuum pumps each with a displacement of 3,200 cu. ft. and one with a displacement of 3,600 cu. ft. per minute, the latter being driven by a 110-h.p. motor. Each Owen's machine is equipped with two motors—a 7½-h.p. unit for rotating the machine and a 3½-h.p. one for raising and lowering it *via* three screw jacks. These machine motors are d.c. and there is a drum-type starter for the raising and lowering motor while a Westinghouse resistance regulator provides for twenty-eight speeds of the machine motor.

The Annealing Process

We were told that if the bottles from the machines were allowed to cool naturally the stresses set up in the glass would result in many breakages, so that annealing to relieve these stresses is of vital importance. For this purpose, for each machine there is an electrically heated lehr the function of which is to maintain the temperature of the glassware sufficiently long to relieve the stresses.

The lehr is a tunnel type of electric furnace about 85 ft. long. The heating zone of the tunnel is about the first ten ft. at the receiving end, while about 20 ft. at the discharge end is just the open conveyor and is used as an inspection table and for final cooling. The conveyor is a woven wire mattress running the whole length of the lehr and is fed at the receiving end by a cross conveyor. As each row of bottles on the cross conveyor is completed it is gently and automatically pushed forward into the lehr by a descending arm which has also a horizontal movement. A ¼-h.p. motor serves the loader, the lehr conveyor being driven by a ½-h.p. induction motor.

To compensate for heat losses in the lehr there are a 7½-kW heater under the cross conveyor and also a bank of elements totalling 15-kW on the walls of the tunnel. These heaters are nichrome coils threaded through specially formed fire bricks with internal end-to-end holes. The idea is to avoid exposed elements in a furnace where there are moving metal parts. To assist the proper cooling of the ware during its passage through the lehr, air is circulated through only part of the tunnel at the delivery end by two fans, one fan being situated externally at the delivery end of the furnace and the other somewhere about half-way along the lehr. A further recent electrical development is a lehr for firing enamel on to the glassware. This has preheating elements under the conveyor at the delivery end of the hot zone.

For transport in and about the works there are a number of battery trucks, for the servicing of which there is a well-equipped and somewhat unusual charging station. A 60-kW a.c. to d.c. motor generator supplies, at 40 V, an eight-way charging board, each way having a rheostat, d.p. switch, d.p. fuses and an automatic voltage regulator. Immediately outside the machine house are two charging platforms, and batteries can be pushed to and from trucks drawn alongside, so that battery charging can go on while the trucks are in use. The batteries are of the Edison type and the charging station equipment was supplied by Lancashire Dynamo and Crypto, Ltd.

Power Supply

With the exception of the moulding machine and railway motors practically all the drives throughout the factory are a.c. slip-ring and s.c. induction motors with star-delta starters, most of the motors being of Metropolitan-Vickers manufacture. For the d.c. supply there are, in the power house, an M.V. 160-kW m.g. set with a 750-h.p. synchronous motor drive for power factor correction and an 85-kW set which serves mainly as stand-by. In common with the works as a whole, in consequence of the demands of the furnace equipment, the large m.g. set runs continuously day and night from the day after Boxing Day to Christmas Eve.

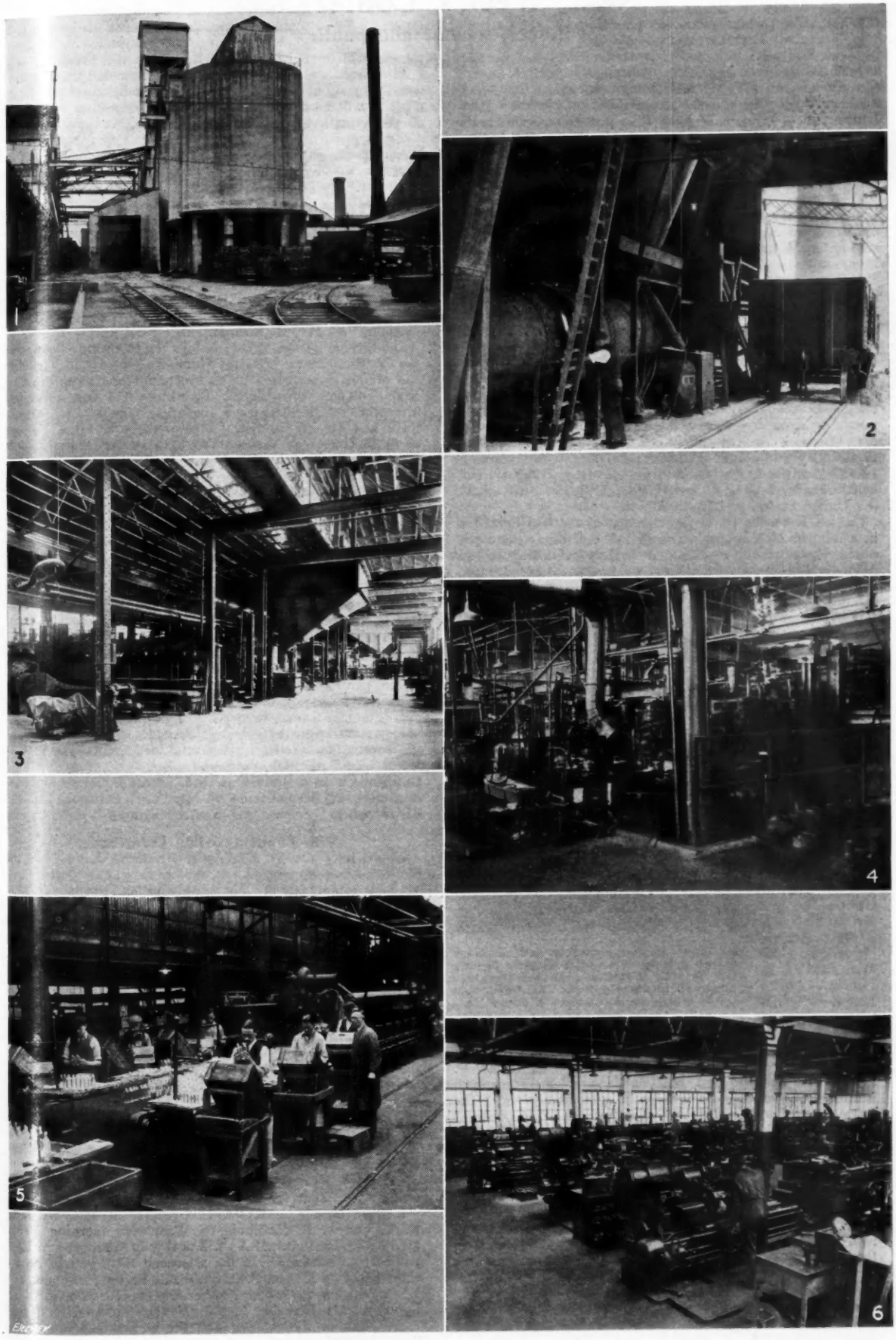
We imagine that the resulting 95 per cent. power factor and 62 per cent. load factor are, from the supply point of view, among the best installation conditions found anywhere. Supply is received from the South Metropolitan E.L. & P. Co. at 10,000 V and reduced to 400-V, 3-phase on site, and main distribution is *via* an open-type slate switchboard with oil circuit-breakers. Serving the steam plant there are two 20,000-lb. per hr. stoker-fired Babcock & Wilcox boilers and also two incinerator boilers in which disused paper and wood boxes from the works are disposed of. The coal-fired boiler plant includes overhead bunkers served by a rotary truck tippler, an elevator and conveyors.

An engineering manufacturing shop mainly for the production of glass machine moulds, patterns, sheet steel, mould maintenance, blacksmiths' and electricians' shops are all important adjuncts to this large manufacturing service, and in the engineering manufacturing shop we saw a layout, with some fine examples of individual drives, far superior to many designed purely productive purposes.

A Giant "Stop Watch"

On the left tower of the Marathon Gate at the Olympic Stadium, Berlin, was installed one of the 150 electric clocks running in synchronism with a master clock. On the right tower is a great "stop watch" with a large hand 11 ft. 6 in. in length. In spite of its size, no difficulty has been experienced in starting and stopping the hands by means of the mechanism illustrated, which formed part of the intercommunication plant installed by Messrs. Siemens & Halske.

The "stop watch" mechanism at the Berlin Stadium



Processes in the Production of Glass Bottles. **(See previous pages)**

1. Large storage bin. 2. Rotary sand dryer. 3. Some of the furnaces seen from the charging end. 4. One of the glass moulding machines. 5. Electrically heated lehr viewed from the delivery end. 6. Individual drives in engineering manufacturing shop.

Next Week's Conferences

Power, science and public lighting

THREE important gatherings possessing great electrical interest are to be held next week. The first, the World Power Conference in Washington (September 7th to 12th) is international in character; another, the British Association meeting at Blackpool (September 9th to 16th), is of more than merely national significance; while the third, the annual conference of the Association of Public Lighting Engineers at Cheltenham (September 7th to 10th), though of a national nature, is probably the most immediately practical.

This country has a strong electrical representation at Washington, as will have been gathered from the list of names which we published in our issue of August 7th (p. 176), and many papers are being submitted through the British National Committee, the chairman of which is Sir Harold Hartley, C.B.E., and the secretary, Mr. C. H. Gray. The catalogue of papers is a formidable one. The total exceeds two hundred, apart from about eighty papers which are being presented at the Second Congress on Large Dams, which is being held concurrently with the World Power Conference.

The Power Conference papers are allocated to seven sections. Section I covers the physical and statistical bases of national power economy and includes papers dealing with technical, economic and social trends. The countries whose power resources are described are Great Britain (papers by Mr. Frederick Brown, the Mines Department, and Messrs. H. Quigley and A. S. Windett), Belgium, Czechoslovakia, Poland, Austria, Argentina, Norway, Germany, Hungary, Holland, Canada, France, Russia, China, Bulgaria, Switzerland, the United States, and South Africa.

Section II relates to the organisation of the fuel industries in a number of countries. The British coal mining and processing industries are covered in papers submitted by the Mines Department and the Mining Association of Great Britain. Section III, dealing with the organisation and regulation of electric and gas utilities, includes papers by Mr. W. B. Woodhouse ("The Organisation of Private Electric Utilities in Great Britain"); Mr. J. C. Dalton ("The Public Regulation of Private Electric Utilities"); and Mr. H. C. Lamb ("Organisation, Financing and Operation of Publicly-owned Electric Utilities").

Mr. J. C. Dalton, manager and secretary of the County of London Electric Supply Co., leaving Waterloo with his daughter to attend the World Power Conference, at which he is reading a paper

The subject of Section IV is national and regional planning for the most efficient utilisation of natural resources; papers on coal and petroleum are contributed by Dr. F. S. Sinnatt and Sir John Cadman. Special problems in regional planning are studied in Section V, the papers including, "The Scope, Duties and Possibilities of a National Water Board," by Sir Alexander Gibb, and "The Integration of Electric Utilities in Great Britain," by Mr. H. Hobson.

Section VI contains papers on the rationalisation of distribution, and there are two by British authors: "Rationalisation of the Distribution of Electric Energy," by Mr. J. R. Beard, and "Rural Electrification in Great Britain," by Mr. S. E. Britton. The last section (VII) on national policies does not include any contributions from this country. The Dam Congress papers deal practically wholly with civil engineering aspects.

A large party of delegates left Waterloo on Wednesday morning to join the "Queen Mary" at Southampton. Our photographers were present and secured the pictures reproduced on page 323.

The B.A. Meeting

The Blackpool meeting of the British Association is being held under the presidency of Sir Josiah Stamp, G.B.E., whose address on "The Impact of Science upon Society," will be delivered at the inaugural general meeting on Wednesday evening next. The president of Section G—Engineering, is Professor W. Cramp, D.Sc., M.I.E.E.; he will deliver his address on "The Engineer and the Nation" on Thursday morning. A number of subjects of electrical interest will be discussed in this section as well as in Section A—Mathematical and Physical Sciences, and Section B—Chemistry.

Among the papers to be read before the Engineering Section are the following: "The Economic Incentive of the Engineer," by Dr. C. C. Garrard; "Progress towards a Test Specification for Incremental Magnetic Qualities," by Dr. L. G. A. Sims; "Electricity for the Consumer," by Mr. H. F. Shanahan; "Beam Wireless: The Beam Array, Developments in Design and Influence on Long-distance Communication," by Mr. A. W. Ladner; "A Note on the Operation of a Variable Oscillator for Speech Frequencies, with an Iron-cored Choke," by Dr. E. W. Marchant; "Headlight Glare and Illumination in Fog," by Dr. W. S. Stiles; and "High-speed Diesel Engines," by Mr. H. Ricardo.

The Physics Section papers include the following: "Apparatus for Maintaining Constant Humidity," by Dr. E. Griffiths and Mr. J. H. Awbery; "The Production and Application of High Voltages," by Dr. T. E. Allibone; "The Ionisation Measurement of Short-wave Radiation," by Dr. G. W. C. Kaye and Mr. W. Binks; "Measurement of High Voltage by Spark Gaps," by Professor W. M. Thornton; "The Breakdown of Dielectrics under Transient Electrical Stresses," by Mr. R. Davis; "Some Aspects of the Electric Strength of Dielectrics," by Dr. S. Whitehead; "Some Electrical Discharge Phenomena on High-voltage Systems," by Mr. C. W. Marshall; "New Probe Measurements in a Low-pressure Gas Discharge," by Dr. J. A. V. Fairbrother; papers on superconductivity by Dr. H. Grayson Smith, Dr. K. Mendelssohn and Mr. J. G. Daunt; and "The Acoustic Jet Generator," by Dr. J. Hartmann (with demonstration).

Among the subjects to be discussed in the Chemistry Section is electro-plating. Papers will be presented by Mr. D. J. McNaughton, Mr. A. W. Hothersall, Dr. S. Wernick, Mr. E. A. Ollard, Mr. C. F. J. Francis-Carter, and Dr. H. J. T. Ellingham. In connection with this discussion an exhibit of electro-plating is being arranged by the Electrodepositors' Technical Society in the Chemistry Laboratory of the Blackpool Grammar School.

The visits, which are being arranged in connection with the meeting, include the inspection of the Metropolitan-Vickers works, Trafford Park, and the Blackley establishment of Imperial Chemical Industries, Ltd. One of the two evening discourses will be delivered by Mr. C. C. Paterson, O.B.E.; his subject is "Science and Electric Lighting."

The Public Lighting Conference

As we have already mentioned, Mr. E. C. Lennox, of the North-Eastern Electric Supply Co., is to preside at the Cheltenham conference of the Association of Public Lighting Engineers.

A Council meeting and the annual general meeting are to be held on Monday afternoon and will be followed by the opening of the exhibition of lighting equipment in the Winter Gardens by the chairman of the Cheltenham Lighting Committee (Ald. James Moore). In the evening there will be a reception by the Mayor, followed by a cabaret and dance.

The proceedings will be inaugurated on Tuesday morning by the Mayor, who will accord the civic welcome, and Sir Charles Bressey, C.B., of the Ministry of Transport will open the conference. Mr. Lennox will deliver his presidential address and will be followed by Alderman W. E. Wilford (Leicester), who will deal with "The Ministry of Transport Report from a Layman's Point of View."

After luncheon a short paper on "Street Lighting Practice in Holland" will be read by Professor G. B. van der Werfhorst, and later the delegates will visit the exhibition. The evening will be devoted to a conversazione and an inspection of the town's lighting.

A paper on gas lighting will be read by Messrs. W. J. G. Davey and A. R. McGibbin on Wednesday morning. Then Mr. W. J. Jones (E.L.M.A.) will deal with "Progress in Electric Street Lighting." In the afternoon there will be read a short paper by Messrs. F. C. Smith, K. F. Sawyer, D.Sc., and D. G. Winslow on "Some Further Aspects of the Street Lighting Problem: Kerbside Lighting." The president will hold a reception in the evening and the annual banquet at the Town Hall will follow.

The Thursday proceedings will include a paper by Mr. J. N. Aldington, B.Sc., on "Developments in Electric Discharge Lamps," and a charabanc tour of Cotswold villages. Special arrangements have been made for the entertainment of lady visitors during the conference.

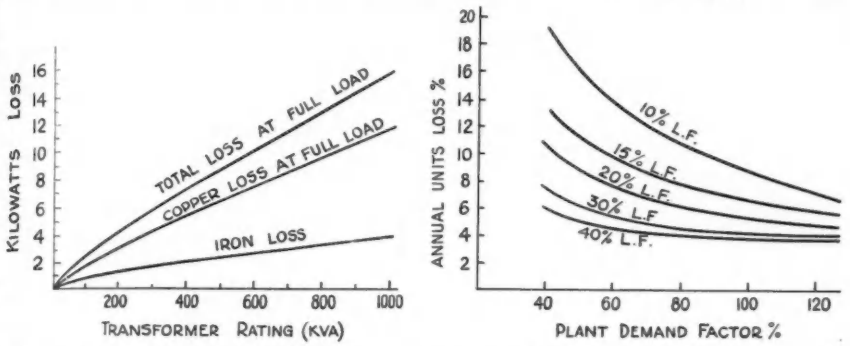
Losses in Distribution.

By D. P. Sayers, B.Sc., A.M.I.E.E.

A practical analysis

THE latest statistical returns published by the Electricity Commissioners show that during 1933-34 13.8 per cent. of the net total output of public supply stations in this country was "lost in transmission, distribution, or unaccounted for." This figure was the average for the country as a whole, losses on individual undertakings ranging from about 5 to 25 per cent. or more. There is a tendency for the loss to increase as time goes on; in 1929-30 it was 13.1 per cent.

All losses occurring in distribution can be classified broadly under (1) copper losses in every part of the circuit and (2) fixed losses independent of the load. Every system will include some or all of the following sources of loss:—



Left: Losses of typical transformers. Right: Effective total loss per cent. of 100-kVA transformer (at 0.9 power factor): Iron loss, 700 W; copper loss, 2,000 W

(*a*) *Main transformers.* The loss is affected by such design features as voltage ratio, method of cooling, etc. As a rough guide the fixed loss on a typical 25,000 kVA unit is about 0.25 per cent.; the percentage increases for smaller sizes, rising to about 0.5 for a 1,000 kVA unit. The ratio of copper loss to fixed loss can be designed between broad limits and in practice usually lies between 2.0 and 3.5.

(*b*) *Extra-high-voltage cables.* The dielectric loss in 33 kV cables may amount to about 1.3 kW per mile of three-phase circuit, rising to 6 kW per mile for 66-kV cables.

(*c*) *Overhead transmission mains.* The loss due to leakage and/or brush discharge may be appreciable. Practical data on this subject is scarce but figures taken on an extensive 33-kV overhead system using pin insulators and located near the coast indicated a loss ranging from 210 W per mile in fine weather to 420 W per mile under adverse weather conditions. The effect of this loss may be considerable, particularly on lightly loaded rural distributors.

Secondary Distribution System

(*d*) *Distribution transformers.* The fixed losses of distribution transformers undoubtedly predominate on all a.c. systems. The loss depends on the quality of the transformer and voltage ratio, etc., but on an average the fixed loss ranges from about 0.5 per cent. of full load rating for a 1,000 kVA unit, rising to 1.0 per cent. for a 25 kVA three-phase unit.

(*e*) *Rotary convertors.* The loss is dependent upon such design features as voltage, voltage-control equipment, number of phases, etc. The no-load running loss for a typical 1,500-kW machine can be taken as 2.5 per cent. of full load, and the full load copper loss is about twice this figure, i.e., 5 per cent.—these figures including the convertor and its associated step-down transformer. The no-load running loss cannot be treated on the same basis as the fixed loss of a static transformer, as it is general practice to shut down some of the convertors on a d.c. system during light load periods, whereas transformers are usually left constantly in circuit. Nevertheless, d.c. conversion losses are relatively very much higher than those in any operation occurring on a.c. systems.

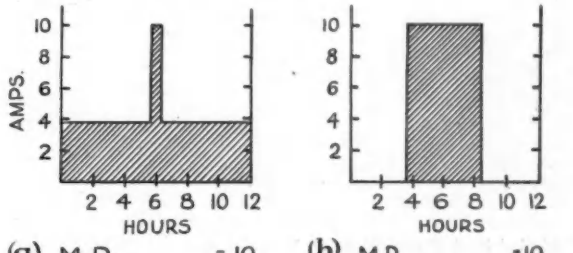
(*f*) *Mercury arc rectifiers.* The losses on units rectifying to standard d.c. distribution voltages are relatively high. On a 1,500-kW steel-cylinder rectifier with its transformer the light-running loss may amount to about 2.0 per cent. which rises to about 7.0 per cent. at full load. On small glass-bulb rectifiers the losses are heavier.

(*g*) *Supply meter shunt coils.* The maximum permissible loss in meter shunt coils according to B.S. Specification is 1.5 W for a.c. meters and 5 W for d.c. meters. While these figures seem small they are by no means negligible. For instance a meter with a fixed shunt loss of 1.5 W absorbs 13 kWh per annum, and on an average domestic consumer's consumption of, say, 400 kWh p.a. this represents a loss of 3.25 per cent per meter. In practice the actual loss may be greater, as a large proportion of installations have more than one meter installed.

(*h*) *Miscellaneous losses.* Apart from the specific losses already mentioned there are transformer magnetising currents and capacity charging currents present in any high-voltage system which give rise to ohmic losses in transmission through lines and cables. As a rule the capacity and magnetising currents tend to neutralise each other and the effective loss is probably very small.

The effective value of the fixed losses over any period under practical supply conditions is much greater than is apparent from the figures mentioned above on account of (a) power factor, (b) load factor and (c) plant-demand factor. Any fixed loss expressed as a percentage of the total kWh supplied varies inversely as each of these factors. Under the most favourable conditions likely to obtain in general practice, say 30 per cent. load factor and 100 per cent. demand factor, the loss is 4.5 per cent. and this rises to 10 per cent. for a 15 per cent. load factor and 60 per cent. demand factor. Demand factors of from 60 to 80 per cent. are not uncommon, since there is a natural tendency to install transformers of sufficient capacity to cope with the load for two or three years ahead, estimated on an annual increase of 10 to 15 per cent.

The difficulty in estimating the loss in any part of a distribution system is that the load factor for that part may be appreciably different from that of the whole undertaking as measured at the generating station or bulk supply point. This is due to diversity factor between which a load factor or reciprocal relationship appears to exist. Thus the average individual load factor of power loads may be relatively high at 25 per cent., and the small diversity between consumers results in the undertaking load factor being only slightly higher at, say, 30 per cent. On the other hand, ordinary domestic consumers have low individual load factors. Taking a typical good-class installation using 5,000 kWh per annum with a maximum demand of 6 kW the load factor is 9.5 per cent., but the large diversity between such consumers results in an undertaking load factor of the order of 30 per cent. This point is illustrated by figures quoted for a housing estate comprising 500 semi-electric houses, in which an annual load factor of 1.6 per cent. per house (on kW connected), became 40 per cent. on the local distribution peak and 65 per cent. on the generation peak. In a typical undertaking supplying a fairly large proportion of domestic load the percentage load factor may graduate on the following lines: On undertaking at generating station, 30; main transmission, 28; high-voltage feeders, 25; distribution transformers, 20; low-voltage distributors, 15; service cables, 4.



Extreme shapes of load curve

The important inference is that, as a general rule, distribution transformers normally work at a load factor considerably lower than that of the undertaking as a whole; hence the fixed losses on these transformers become greater. As a corollary it follows that the copper losses on low-voltage distributors become less important.

Calculation of Copper Losses

Over a period when the current is varying the copper loss equals (I^2) mean × R. This cannot be directly calculated from known values of maximum demand and load factor, since the

value of load factor does not define the shape of the load curve. Thus the two extreme shapes of load curve illustrated have the same maximum demand and load factor, but the mean square current in one is 17.5 against 40 in the other. The shape of the load curve is defined by the form factor, and the relationship between them can be deduced as follows:—

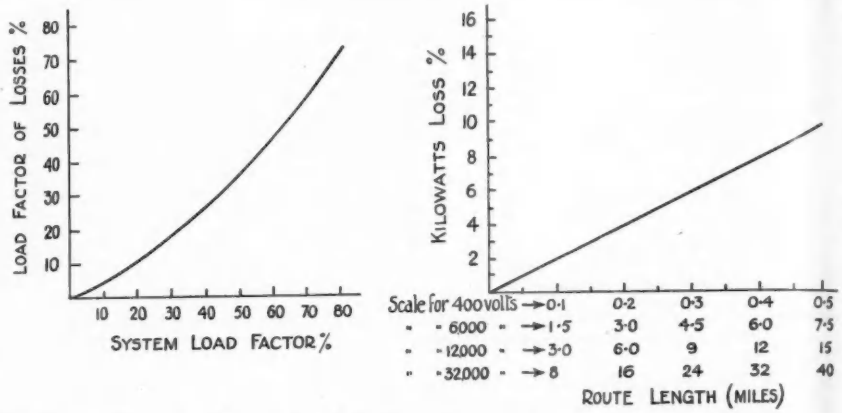
Load factor = I average/I max., whence I max. = I average/load factor, or $(\text{I max.})^2 = (\text{I average})^2/(\text{load factor})^2$. Form factor = $\sqrt{(\text{I}^2)\text{ mean}}/\text{I average}$, whence $(\text{I}^2)\text{ mean} = (\text{I average})^2 \times (\text{form factor})^2$. Now loss factor (*i.e.*, load factor of losses) is ratio of average loss to loss at full load = (I^2) mean $= (\text{I max.})^2 = (\text{I average})^2 \times (\text{form factor})^2 \div (\text{I average})^2/(\text{load factor})^2$; *i.e.*, loss factor = $(\text{form factor})^2 \times (\text{load factor})^2$.

In practice the shape of the average load curve lies between the extremes shown in the diagram. The load factor in both cases is 40 per cent. and for a typical undertaking working at this load factor the form factor will be about 1.3. At a theoretical load factor of 100 per cent. the form factor cannot exceed 1.0, but as the load factor decreases the form factor will increase. At 15 per cent. load factor the form factor will be about 2.0.

Since the load over a period is equal to maximum load times load factor and the copper loss is equal to loss at full load times loss factor, then if the loss at full load is known, the effective loss over the period can be calculated from: Effective copper loss per cent. = loss factor per cent./load factor per cent. × full load copper loss per cent.

Hence any calculations dealing with copper losses can be much simplified by the use of the curve shown.

If, for a given load factor, the demand on the plant is halved, the total units are halved and the copper losses are quartered. The *percentage* copper loss is therefore halved, and it is thus seen that the effective value of the copper loss varies directly as the demand factor.

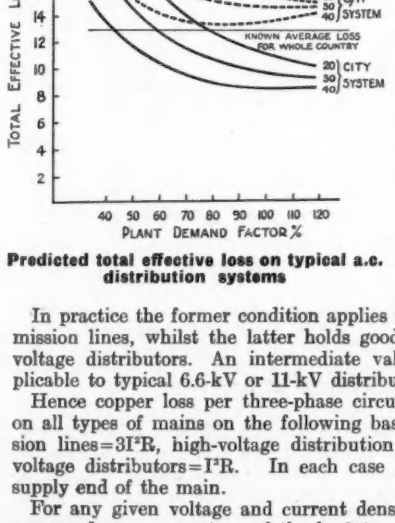


Left: Variation of loss factor with load factor on a typical system with average form factor values. Right: Percentage kW loss on three-phase cable when loaded to 1,000 A per sq. in. (power factor 0.95)

Copper Losses on Mains

Copper loss per phase of an untapped feeder in which the current is the same from end to end is I^2R, where I is the current and R the resistance per phase.

When the load is tapped off at intervals, only the first section of the main carries the full current and the loss is smaller. If load is tapped off uniformly all along the main so that the current becomes zero at the far end then: Copper loss per phase = $\text{I}^2\text{R}/3$ where I is the maximum current at the supply end.



Predicted total effective loss on typical a.c. distribution systems

In practice the former condition applies to most main transmission lines, whilst the latter holds good generally for low-voltage distributors. An intermediate value is probably applicable to typical 6.6-kV or 11-kV distribution mains.

Hence copper loss per three-phase circuit can be estimated on all types of mains on the following basis: Main transmission lines = $3\text{I}^2\text{R}$, high-voltage distribution lines = $1.5\text{I}^2\text{R}$, low-voltage distributors = I^2R. In each case I is current at the supply end of the main.

For any given voltage and current density, the copper loss expressed as a percentage of the load transmitted is constant irrespective of the size of the main. Thus with constant current density, if the size of the main is doubled the resistance is halved and the load is doubled, so that the value of I^2R is doubled; as the load is also doubled, the ratio of loss to load remains the same.

For any three-phase circuit it can be shown that the percentage copper loss = 173 RD/E×P watts per 1,000 yd., where R = resistance per 1,000 yd. of 1 sq. in. conductor, D = current density in A per sq. in., E = volts between phases, P = power factor.

For a copper line or cable loaded to 1,000 A per sq. in. this expression becomes, approximately: Percentage copper loss = 4000/E×P per 1,000 yd.

From the accompanying curves prepared on this basis, the loss on any size and voltage of three-phase main can be readily ascertained.

From the foregoing it follows that if the value of the losses in each part of a system is known in terms of a percentage of full load, the total effective value of the losses over a prolonged period can be estimated on the basis that all fixed losses vary *inversely* as power factor, load factor and demand factor, and that all copper losses vary *inversely* as the power factor, and *directly* as the loss factor (the product of load factor squared and form factor squared) and *directly* as demand factor.

In making such a calculation for a whole system it is sufficient to consider any one typical path of current between the consumer and the generating station and sum the percentage losses occurring on each section of that path without regard to the different total loads carried by each section. This holds good provided that proper allowance is made for the probable load factor obtaining on each section.

The total losses in two sets of conditions have been calculated as typical of (a) a large city distribution system, and (b) a large overhead distribution system. The plant included in each case is as follows:—(*a*) Typical city system: Five miles 0.2-sq. in., 33-kV cable; 10,000-kVA main transformer; three miles 6.6-kV feeder; 300-kVA distribution transformer; 400 yd. low-voltage distributor.

(*b*) Typical overhead system: Twenty miles 0.1-sq. in. 33-kV line; 5,000-kVA main transformer; ten miles 0.075 sq. in. 11-kV line; 100-kV distribution transformer; 700 yd. low-voltage distributor.

In each case the total fixed and copper losses have been calculated for different load factors graded according to the following scale:—

Undertaking	20	30	40
Main transmission...	18	26	35
High-voltage feeders	15	21	28
Distribution transformers ...	12	15	20
Low-voltage distributors... ...	6	9	10
House services	3	4	5

The results have been divided by or multiplied by a series of demand factors to give the final values of total loss as shown by the curves reproduced. As regards demand factor, 100 per cent. has been taken as 1,000 A per sq. in. for lines and cables and normal full-load ratings for transformers.

The results shown are sufficiently in accord with figures given in the Commissioners' Returns to substantiate the hypothetical basis on which the curves have been prepared. It must be noted that the losses on systems containing an appreciable amount of d.c. distribution would be somewhat heavier as no allowance has been made for d.c. conversion losses. The curves show that:—

(1) The losses on extensive overhead systems are heavier than on city systems, this being due to increased copper losses on the mains and to relatively higher fixed losses on the smaller transformers usually installed on such systems.

(2) Fixed losses predominate under nearly all practical conditions with the result that minimum losses are associated

The Radio Exhibition—II.

By W. E. Miller, B.A.(Cantab.), M.I.W.T.

Impressions of the exhibition at Olympia

THE eleventh National Radio Exhibition, organised by the Radio Manufacturers' Association, which opened on August 26th and closes to-morrow, September 5th, has followed closely the lines forecast here a fortnight ago (p. 241).

At the time that article was written there was no definite information on the television position, but since then events have taken place which have made television reception at Olympia possible. On the Monday before the opening of the show an experimental series of transmissions from the B.B.C. station at the Alexandra Palace commenced, and these programmes are being picked up at Olympia, and are to be seen and heard on eight receivers by different (unnamed) manufacturers. The receivers are installed in public viewing booths, and are proving a big attraction. Regular transmissions employing the Baird and Marconi-E.M.I. systems are being made on alternate days.

Owing to the experimental transmissions, more firms are showing television receivers than was forecast. In addition to the Bush Radio, G.E.C., H.M.V. and Marconiphone models, receivers are also being shown by Cossor, Ekco-Scophony, Ferranti, Halcyon Radio, Philips and Pye Radio. With one exception, all these receivers use the cathode-ray tube, the screen of which is viewed either direct or *via* a plane mirror. In at least one case a large lens gives a degree of magnification of the image. The exception is the Ekco-

A general view showing the convenient arrangement of the exhibits at Olympia

Losses in Distribution (*Continued from previous page*)

with higher load factors and higher demand factors, although there may be a tendency for the copper losses on an overhead system to assume importance at high load factors.

(3) The total losses are influenced by demand factor just as much as by load factor, the effect being more pronounced when either factor is low.

(4) An analysis of the calculated results shows that the distribution transformer is responsible for 50 per cent. or more of the total losses on the system under nearly all conditions.

Conclusions

Although the mains engineer has no direct control over load factor, he can control the demand factor on his plant by careful estimating and operation. It has been shown that the copper losses on mains are not negligible, especially on overhead systems, but the economics of these are governed by Kelvin's Law. Any reduction must be offset by increased capital expenditure in providing additional copper; consequently a low loss does not necessarily indicate the most economical condition.

As regards transformer losses, however, the situation is very different and the main object of these notes is to emphasise the importance of reducing the effective losses on distribution transformers wherever possible. It is obvious that the relatively low loadfactors obtaining at the consumers' end of the distribution system lie at the root of the problem and any improvement in this direction, *e.g.*, off-peak heating, will materially reduce the effective loss and improve the efficiency of plant utilisation all through the system. Apart from this possibility there are various other directions in which economies can be effected and the following practical suggestions are put forward:—

(1) A proper routine system of collecting and filing operating statistics is most important in order that reliable data may be available as to loading conditions on every part of the system. More often than not no such system exists; first, because there are no technical facilities for obtaining load indications on mains and sub-stations and, secondly, because no one is assigned the definite duty of analysing and checking the results obtained.

(2) In every new situation the size of transformer should be kept to a minimum consistent with the estimated growth of load and with full allowance for diversity between loads and distribution. Where there is a large proportion of purely lighting load as, for instance, in a shopping centre, it may be better to install two smaller units in place of one large one. This provides duplicate supplies and during the summer season one transformer can be taken out of circuit, thus cutting down the fixed losses.

(3) All specifications for transformers should state clearly that tenders will be compared on the basis of total annual costs, the figures to include capital charges at a given rate plus losses assessed on a given definite basis. If such information is given in precise form the manufacturer has a free hand to put forward what he considers to be the most truly economical design.

Scophony model, which operates on the Scophony mechanical-optical system, the picture being projected on to a vertical ground-glass screen. Incidentally, this system does not involve the use of voltages higher than those normally encountered in ordinary radio receivers, and the receiver is convertible for the reception of the Baird 240-line and Marconi-E.M.I. 405-line transmissions just as easily as are the cathode-ray models.

In general the operation of the receivers should not be a difficult matter, in view of the fact that many of the controls are pre-set by the manufacturers. In a typical case (G.E.C.) the only variable controls are tuning (which automatically adjusts the receiver for sound and vision at the same time) a volume control for sound, a change-over switch for reception of the two different systems, a picture contrast control and the horizontal and vertical "lock" or "hold" controls. In other cases tuning is pre-set, and a brightness as well as a contrast control may be included, while in the case of the Philips set, there are only two controls which need normally be operated.

More than Twenty Valves

These receivers usually employ something of the order of twenty to twenty-four valves in all, but it must be remembered that rectifiers and gasfilled relays for the time-base circuits are included in these. The picture size is usually about 10 in. by 8 in. or a little larger for the cathode-ray models, and 16 in. by 12 in. for the Ekco-Scophony instrument. Prices so far have been fixed by only a few of the firms, and they are about 90-95 gns. for a model for television and its accompanying sound only, and about 120 gns. for a model which will also receive on the normal sound wave-bands.

Television apparatus, apart from receivers, is quite prominent at the Show. Bush Radio is showing what is claimed to be the largest cathode-ray tube in the world. The screen of this has a diameter of 22 in. The G.E.C. has an interesting demonstration of the method in which a cathode-ray tube works in producing a television picture. Controls are provided, and the effect of the various adjustments can be seen on the screen of a tube and also in a diagrammatic representation of the section of a tube, using a light beam to indicate the electron stream.

All the television tubes are of the high-voltage "hard" types, but small "soft" tubes are still available for use in oscilloscopes. These instruments have a variety of uses, including the delineation of wave-form. In radio factories, for instance, they are often employed to provide visual indication of the characteristics of the intermediate frequency amplifier, and the tuning of these stages is adjusted by means of an oscilloscope to give the correct band-pass response. It would be almost impossible to do this accurately by any other method. Cathode-ray oscilloscopes are shown by Ediswan, Cossor and E.M.I. Service, Ltd.

Valve Exhibits

Valve manufacturers have not failed to appreciate the growing importance of television, and in many cases specialised types of valves have been produced for use in vision receivers, where the frequencies of 45 mc/s which have to be handled, and the very wide frequency bands which must be amplified without attenuation, demand valves with extremely low inter-electrode capacities. Mullard, G.E.C. ("Osram"), Marconi and B.T.H. ("Mazda") are all showing special types of valve for television work. In practically all cases the control grid is brought out to the top cap on the valve.

Another interesting valve exhibit to be seen on a number of valve manufacturers' stands is the midget "acorn" type, which was first introduced in America, and is now made by the B.T.H. Co., Mullard and Marconi-Osram. It derives its name from its shape and size, in both of which it resembles a large acorn. The electrodes are small, and the fact that their connections are brought out radially round the top of the "cup" of the acorn, thus obviating the necessity of a glass "pinch," results in very low inter-electrode capacities. So successfully have capacities been reduced that these valves will work well down to wavelengths of 0.7 metre.

Special rectifier valves have just been introduced by Marconi-Osram. One, the U18, is capable of delivering an output of 250 mA at 500 V, and is therefore suitable for the h.t. supply of large receivers and amplifiers. For television work, there are two types, the U16 and U17. These supply the high-voltage and comparatively low-current requirements of cathode-ray tubes. Thus the U16 delivers 2 mA at nearly 5,000 V. In this connection the special Westinghouse metal rectifiers for television h.t. requirements must also be mentioned.

Receivers and Radiograms

In the article which gave a forecast of the exhibition was included a general impression of the present stage of progress in receiver design. An actual inspection of the exhibits leaves very little to be added to this. Thanks to the efforts of component manufacturers, modern receiver chassis have reached an advanced stage of compactness and efficiency. There is hardly a chassis to be seen which does not impress one with its workmanlike construction and general neatness of layout. Mechanical features, as well as electrical ones, have advanced in efficiency and utility. There are many ingenious arrangements of controls, indicators and tuning scales, which include the use of Bowden cables, cams, gears, pulleys and similar devices. The Philips and Mullard single rocking knob control was mentioned in the last article as an example of this. The cathode-ray type of visual tuning indicator is prominent on many stands.

Cabinet design reveals the extensive use of matching, figuring and inlay work to produce a tasteful appearance, but only in a few cases does it seem that acoustic considerations have entered into the design. Most radiograms consist merely of the corresponding receiver chassis fitted into a larger cabinet with a pick-up and electric gramophone motor, or a simple form of record changer, usually of the Collaro or Garrard types. It is the exception, rather than the rule, for even large radiograms to be provided with any bigger or better output stages than are used in the corresponding small table receivers.

Before leaving the subject of cabinet design and finish, mention must be made of some exquisite examples of the cabinet maker's art to be seen on the R.I. (Aeronautical and General Instruments) stand. Some of the table receivers have coloured art cabinets, which are hand finished in cellulose. The controls being at the sides, the fronts of the cabinets are available for decoration, and on each a charming design is hand-painted by a well-known tapestry artist. The designs include a Wedgwood frieze, Chinese floral paintings and a Kate Greenaway scene. The stand also contains some beautiful cabinets built from rare English and Empire woods, finished in natural colour to emphasise the grain.

Accessories and Components

Interference supression is demonstrated on several stands, including T.C.C., Dubilier and Belling-Lee. The last concern has a very interesting exhibit. Apart from the working demonstration of the effect of small domestic electrical appliances in producing interference, and of Belling-Lee suppressors in reducing it, there is a convincing exhibit showing the advantages of the "Eliminoise" aerial in reducing the interference picked up from violet-ray apparatus.

Although components for home construction are not prominent, several makers still cater for this market, including A. F. Bulgin, who have a most comprehensive range of components and accessories, Ferranti, Rothermel, Sound Sales, Stratton (Eddystone), Varley, Wingrove & Rogers ("Polar"), and Wright & Weaire ("Wearite").

Convertors, enabling the short-wave bands to be covered by ordinary receivers, are available from many manufacturers, some being claimed to extend as low as 5 or 6 metres, thus enabling the television sound programmes to be received. They are not, of course, suitable for the vision signals, even though they may be capable of picking them up. Specially designed receivers for accepting and amplifying a very wide frequency band are essential for this.

Public Address Equipment

Public address equipment seems to appear on almost every third or fourth stand. Apart from such firms as Tannoy, Ardente, Film Industries, Marconiphone, Multitone and others well-known in this sphere, it would seem that many other firms have considered it worth while to produce amplifiers and equipment for this purpose. Remote control apparatus is shown by Whiteley Electrical, Aerodyne and Self-Changing Gramophones. The last firm, by the way, has an ingenious record-changer handling thirty-three records at a time, and playing both sides of each.

Batteries and accumulators show little change. It is interesting to note that the Chloride Electrical Storage Co. ("Exide") has recently carried out an analysis of the battery receiver market, which indicates that the majority of the sets require an l.t. current of 0.6 A or more. This indicates that the "mass" type cell, produced for use where the current consumption was less than 0.5 A, is no longer suitable for the majority of sets. The Chloride Co. has brought out a range of multi-plate cells suitable for modern requirements.

The needs of the service engineer are now well catered for by the instruments and even complete workshops (E.M.I. Service) which are available for his use. Replacement components are also sold by firms such as Dubilier, Radio Resistor and the Radio Development Company.

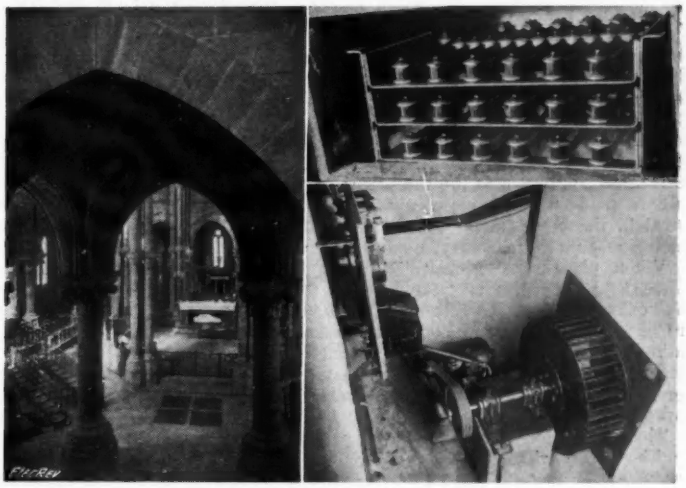
In conclusion, it may be said that Radiolympia marks the opening of a new radio season, and one which, with the help of television, promises to be particularly interesting.

Large-scale Heating in France

Sanatorium and church installations

IT is estimated that, with the installations put into service last winter, the total volume of buildings heated electrically in France amounts to some 1,750,000 cubic metres, while the connected load of these is 100,000 kW. The larger installations are for sanatoria, where electrical heating enables a considerable saving to be made. That at the Aincourt sanatorium is of 4,500 kW. Next comes Arniéres with 4,200 kW. Both of these installations are the work of the Alsthom concern.

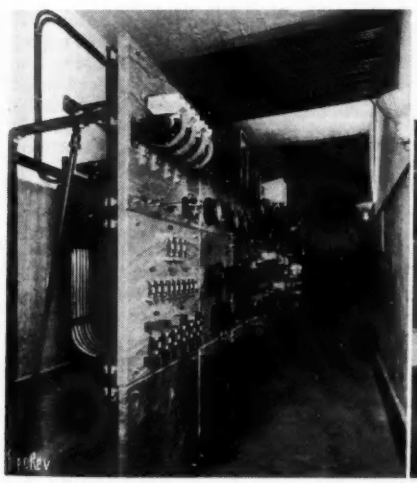
In the Aincourt sanatorium the use of steam for heating was impracticable on account of the fact that the buildings to be heated are so separated from each other that substantial heat losses would have occurred during transmission. This has been avoided by the use of electricity. The heating installation is divided into storage, semi-storage and direct heating radiators. These are so connected that the general heating is by storage, while that of the rooms is by semi-storage or direct heating, the latter being used only for a short time each day when it is desired to raise the temperature rapidly.



The Church of St. Cecile, Le Havre, showing air vents in the floor; also the coils and the fan in the air-heating system

The control of the connections is entirely automatic, except for the direct heating radiators, which are switched on only when needed. This control is divided into two steps, one being general and the other in respect of each particular circuit. The general control device has a thermometer placed outside the building which regulates the number of hours during which the load is left on as a function of the outside temperature. The circuit controls consist of time-clocks with contacts whereby the circuit is made and broken at the desired hours of the day. This permits various parts of the building to be treated differently according to the time of day they are occupied. Thus the dining-rooms have only to be heated before meal times, whereas the bedrooms require heating in the evening, and the corridors must be heated all day.

There is a thermostat in each room, and if the temperature rises above a pre-set maximum the radiator is cut off. Overload on the whole installation is avoided by three current-limiting relays which are operated by time clocks. One of these is for night load, one for day load and one for peak load hours. Each cuts out the whole installation whenever the load rises above the maximum fixed for that hour of the day.



The main switchboard of the installation at the Aincourt Sanatorium. In the centre is a room with a wall radiator, and on the right the method of corridor heating is illustrated

Rapid Heating for Churches

In the heating of churches, which is also making good progress, it is necessary to obtain rapid warning at certain hours only. Radiators of various types have been used, but they involve either a connected load considerably above what would normally be required for the volume, or the time of utilisation must be lengthened; in either case there is increase in the cost of the heating.

An interesting system for the solution of this problem has been worked out by the Alsthom concern, whereby an air heating system working in a closed circuit is made to raise the temperature to a comfortable level within a sufficiently short time.

The method consists of providing three air vents in the floor of the church and connecting them by conduits in the form of a "T." The junction of the two branches is occupied by a fan, which draws the air in from the single opening and forces it out through the other two. Across each of the two outlet tubes a heating resistance element is placed so that the air passes over it on its way through the duct. The size of the element and the output of the fan are so regulated that the temperature does not rise above about 95 deg. F., which permits sufficiently rapid heating without discomfort to the congregation.

Depreciation of Hired Appliances

It is announced in the official journal of the Incorporated Municipal Electrical Association that as the result of representations by the Association and the Institute of Municipal Treasurers and Accountants the Board of Inland Revenue has extended for five years (until 1940-41) the existing allowances in respect of domestic electrical apparatus on hire. It is thought that at the end of the extended period more evidence will be available regarding the life of these appliances, when further proposals can be submitted. The present rates of allowance are as follows: Cookers and kettles, 20 per cent. on written-down value; refrigerators, washing machines, washboilers and water heaters, 15 per cent.; other kinds of apparatus, 10 per cent. Early in 1935 the question was raised as to a suitable addition to the Income Tax Rules making clear what part of a wiring installation should be included with the appliance for the purpose of the "wear and tear" computation. The Board has approved an addition declaring that the term "appliance" includes such wiring leads as require to be renewed upon replacement of the particular appliance which they serve.

Irradiation of Plants. By V. Sinclair

Results of researches in different countries

ILLUMINATION by electricity for promoting the growth of plants during those periods of the year when sunlight is frequently lacking has had as its object from the first the stimulation and acceleration of growth and, last but not least, the production of early and better yields that would fetch higher prices.

Originally, metal filament lamps combined with special reflectors were employed, but results were inconclusive and often contradictory, owing to the unsystematic nature of the experiments, made without due consideration of the kind of plants treated, the optimum period of treatment, duration of radiation, foot-candles necessary, quality of rays and so on.

When plants are subjected to light, a chemical process termed "photosynthesis" takes place in the green part, where the chlorophyll acts as a catalyst, causing organic substances to be formed from inorganic matter, such as CO_2, water and mineral salts, while oxygen is given off. These organic substances, combined with light and heat, constitute factors of growth. Growth depends on that factor which is present in minimum quantity.

The only factor at the present day which still presents difficulties is that which provides the energy for photosynthesis, namely light. Photosynthesis is promoted by the long waves or red rays, but with the use of these only, the plant grows too long. Short wave-length (blue and ultra-violet) retards growth, but thereby prevents "leggi-ness" green rays being neglected almost entirely. Hence, light containing both ranges of the spectrum is required.

Left: These gloxinias were sown on December 15th, pricked out on March 14th and photographed on April 14th. Right: Gloxinias sown and pricked out as before, but irradiated from March 14th to April 14th for four hours daily with 47 ft.-candles from gasfilled lamps

Experiments in Holland during the winter of 1933-34 by Prof. Sprenger, with the support of the Philips Lamp Works and under the supervision of Dr. Roodenburg, showed that ordinary filament lamps caused the plants to grow too tall and weak as the infra-red rays constitute 95 per cent. of the radiation energy.

Low-voltage 500- and 1,000-W neon tubes, 1.5 metres long, with special reflectors, were suspended 1.25 metres above cucumbers and no increase of temperature was observed. Irradiation was applied during the night-tariff period, namely, between 10 p.m. and 6 a.m. Plants sown on November 6th and irradiated from the 12th of that month until December 29th grew much more rapidly with 1,000-W than with 500-W but their yield was less. The increased yields compared with control plants were 16.2 and 23 per cent. The conclusion was that if plants are required as quickly as possible for planting out, the more intense radiation is preferable, but that stronger plants are formed by irradiation from lamps of 600 to 800 W.

In further experiments with cucumbers in greenhouses, sowing took place on December 1st and planting-out on the 19th; irradiation ceased on January 12th. The temperature was maintained at 73.4 deg. F. When the seedlings were transplanted, much stronger roots were found on the irradiated than on the control plants. This treatment of 100 cucumber plants during forty days of eight hours' irradiation with 600 W required 192 kWh, which at 5 cents per kWh cost 9.60 guilders. Adding 25.00 guilders for depreciation of neon lamps (life 2,000 hours), gave a total cost of irradiation of 34.60 guilders (100 cents=1 guilder=1s. 8d. at par or 2s. 9d. now). The value of the increased production compared with the control plants amounted to 54.40 guilders, so that there was a net profit of 19.80 guilders, but considerably higher prices would have been obtainable by earlier planting.

Experiments were undertaken in the same district on strawberry plants, which were severally irradiated, gassed with CO_2 and subjected to a combination of these treatments. The latter commenced on December 5th at a temperature of 50 deg. F. which was raised to 60 deg. F. on January 9th.

As to size, there was little difference between irradiated and gassed plants, but those that had been irradiated had longer leaf stalks and larger leaves than the non-irradiated plants, while plants irradiated and gassed simultaneously developed best. Irradiated plants and gassed plants bloomed considerably earlier than untreated plants while plants simultaneously irradiated and gassed bloomed much earlier than all others.

Equally successful results were obtained by subjecting various flowering plants to neon irradiation, in particular begonia seedlings, which are rendered more immune to fungoid diseases by the treatment. Star of Bethlehem flowered fourteen days earlier and carried 61 per cent. more blooms with an irradiation of 56 ft.-candles by neon light than the control plants, while lathyrus showed good results with 47 ft.-candles. Irradiation of gloxinias was started on January 8th, three days after the tubers began to sprout, part of the plants being treated with 47 ft.-candles and others with 75. They were transplanted on February 5th when the irradiated plants could be distinguished from the control only by their darker leaf.

On February 23rd the first buds showed on all three subjects, and on March 13th, when the buds were well developed, irradiation was stopped. At this date the number of blooms were, control, 201; moderate irradiation, 236; and strong irradiation, 288.

While the moderately irradiated plants showed only a slight precocity and increase in blooms over the control plants, the strongly irradiated ones flowered a week earlier and produced over 30 per cent. more blooms. Most hothouse plants require an irradiation of from 47 (cinerarias) to 93 (lathyrus) ft.-candles of neon light for eight hours daily, when the power employed amounts to from 69 to 84 watts per sq. yd. and are saleable from two to five weeks earlier.

In Germany, many plants have been irradiated successfully with ordinary gas-filled lamps by harmonising the various factors of growth, principally by compensating for the increased heat by suitable nourishment and by managing with light intensities as low as from 19 to 47 ft.-candles, thus reducing the cost of energy. While the optical efficiency of neon light is higher and better growth frequently results because the heat is less, neon equipments are considered to be too expensive for use in greenhouses.

Investigators in the United States agree with the Germans in regarding as the most *practical* artificial illuminant the gas-filled tungsten-filament lamp. Plants have been classified as long-day and short-day, and others not sensitive to length of day. The first are those which flower normally in late spring and early summer; these can be induced to bloom earlier, some even in winter. Short-day plants, which bloom normally in the autumn and early winter, can be retarded by lengthening the hours of lighting. As a result of tests carried out at Ohio and Purdue Universities, an illumination of 8 to 10 ft.-candles is recommended for five hours nightly as the minimum for plants responding definitely to supplementary light (although for pansies and asters 1.5 ft.-candles for ten hours is sufficient), but that initial installations should be calculated for intensities of 10 to 15 ft.-candles, to allow for depreciation—figures considerably lower than those recommended in Europe.

An American Experiment

In Yonkers, N.Y., a heat-insulated greenhouse has been built with a single row of windows on one side of the roof set at such an angle that the glass is normal to the sun's position on November 5th and February 5th. The interior is painted white, to reflect the light on to the plants. The house is 19 ft. by 8 ft. and is of the lean-to type, with a maximum height of 10 ft. 6 in. Two rows of five 300-W lamps each provided light and heat. These were switched on by thermo-

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Fortunate Glasgow

I have received my electricity account for the first period under the recent reduction in rates for domestic consumers, which works out at an average price of 0.2919d. per unit. The period was from March 27th to August 13th and details are given below.

45 units at 3d.		11	3
405 units at 0.6d.	£1	0	3
5,880 units at 0.25d.	£6	2	6
Total, 6,330 units	£7	14	0

Electricity Dept., T. INGRAM CRAIG,
Glasgow, *August 28th.* *Sales Manager.*

A Lamp Voltage Problem

A recent letter on the problem of making lamps less sensitive to voltage variations raises an important point. So far the only way of dealing with this is to keep the pressure within limits by having cables of large section and by placing sub-stations at numerous points so that the current does not have to travel very far. This may seem obvious enough, but managers of electricity undertakings have sometimes found themselves in difficulties through not buying up sites in areas in the early stages of development. It is better to buy the sites when they are cheap even if it means waiting a year or two before they are required rather than to have to look for space in an area after it has become crowded with houses.

There is, however, another point in connection with lamp voltage which requires careful attention by the Standardisation Committee. When a declared voltage of 230 V is given it is usually assumed that lamps and everything else can be rated at 230 V, but actually this is not so. Most stations which declare 230 V keep their mains between 230 and 240 V, and in actual practice lamps have to be rated at 240 V to give a satisfactory life. High efficiency lamps are not suitable for even a small excess pressure. In one town the life of street lamps was greatly increased by reducing the pressure after 11 p.m. to 5 V below the rated pressure of the lamps, and in many cases where street lamps have had a short life the reason has been that the lamps received bus-bar pressure after 11 p.m., and this was above their normal voltage.

The reduction of pressure in small load periods can easily be arranged with modern self-regulating transformers. Incidentally the manager of one undertaking had the ingenious idea of reducing his pressure on the winter peaks to keep down his bulk supply kilowatt charge, but this is not to be recommended.

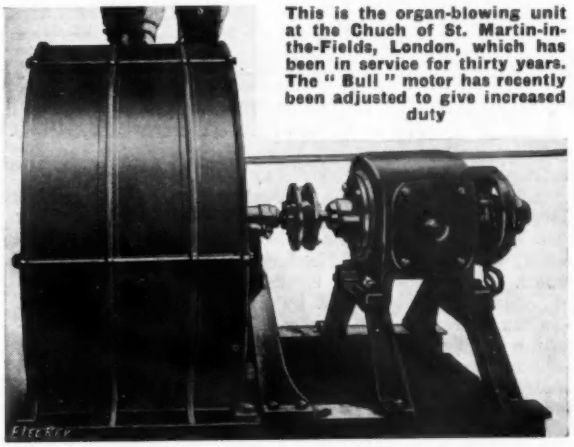
These considerations show that there is need to define exactly what is meant by a standard pressure of 230 V, or other agreed voltage, along with the corresponding pressure on the outers. We have to face the fact that lamps do not take kindly to overrunning, while heaters, motors, &c., do not object to some excess pressure provided that it is kept within moderate limits. If the pressure of 230 V means that lamps are to be rated at this, it appears that cookers, motors and other apparatus must be made for 220 V, as in actual practice they will not receive much over 225 V. Indeed during the periods when these are running there will usually be sufficient drop on the mains to reduce the excess pressure to something not much over 220 V.

On the other hand, lamps are used often when there is not much other load on, particularly late in the evening in houses and in streets, when the drop from bus-bar pressure is relatively small. One way would be to make lamps suitable for, say, 235 V where the rated pressure is 230 V, but lamp makers may object to this. Whatever may be the verdict of the standardising authority, it will be well to have the matter defined. VOLTAGE.

August 29th.

Why Wait for Legislation?

The answer to the question raised in your leading article of August 28th is answered by paragraph 132 (page 25) of the report of the McGowan Committee—"Past experience has demonstrated that any attempt to carry through on a voluntary basis a scheme of reorganisation would be bound to fail."



This is the organ-blowing unit at the Chuch of St. Martin-in-the-Fields, London, which has been in service for thirty years. The "Bull" motor has recently been adjusted to give increased duty

Since 1920 it has been possible for the undertakers in any district to establish a Joint Electricity Authority to do all the more important things which you suggest. They have to get the Commissioners to delimit the District and to approve the scheme of reorganisation. The snag is that the Commissioners have no powers to compel recalcitrant undertakers to

Irradiation of Plants (*Continued from previous page*)

stat at 62 deg. F. and cut off at 68 deg. F. The lamps were never on when the sun was shining; at such times the sash was occasionally opened for ventilation. Supplementary light was obtained for five or six hours per day, which was just what the plants needed to speed up their growth to the required extent.

Plants in the heat-insulated house came into blossom weeks earlier and were larger and more prolific than those in the control house. As the house was practically airtight, 40 lb. of CO_2 was supplied to the plants per week in the form of "dry ice."

The average consumption from December 6th to March 31st was 18 kWh per day, costing (at 2 cents. per kWh) 1s. 6d., which is about twice the cost of coal for steam heating, but the difference is held to be more than offset by the greatly increased growth and flower production and by the saving in labour. The cost of constructing such a house plus the electrical equipment is said to be less than that of an ordinary greenhouse of the same dimensions.

In Great Britain, there does not appear to have been the same co-ordination of research work between lamp manufacturers, institutions and growers as abroad. The General Electric Co., Ltd., is now putting forward the "Osira" flood-lighting lamp (giving a red light) for plant irradiation. The consumption is less than 0.5 kWh per hr. At a distance of 2 ft. areas of 24 and 69 sq. ft. are strongly and weakly irradiated respectively, while at 4 ft. the corresponding areas are 7 and 110 sq. ft. No light intensities are given, because in the absence of international agreement on the unit of light in coloured light sources, any measurements made in the ordinary way are liable to serious error.

Research work is being carried out at the Experimental and Research Station, Cheshunt, Herts, under the direction of Dr. W. F. Bewley, who has found that the high capital cost of neon equipment is prejudicial to its general commercial adoption. The less expensive 500-W gas-filled lamp does not, however, fulfil ideal requirements, owing to the heat given off, which is more detrimental to some plants than to others. For instance, Dr. Bewley's work with tomatoes has been disappointing in any case, although actually the best results were obtained with gas-filled lamps in spite of the fact that the plants grew leggy. He thinks that the first need is the production of a type of lamp similar to the ordinary lamp, but emitting much less heat.

Cucumbers have responded during the propagating stages to such an extent in growth and form that when planted out in permanent quarters without further irradiation they have fruited ten to fourteen days sooner than the control plants. Here the benefit finished, as the total yield from both irradiated and control plants was the same, so that the advantage to the grower is the difference between operating costs (plus interest and depreciation on the equipment) and the increased value of the crop due to earlier marketing. Possibly, if the plants were sown earlier the yield might be higher, as they found in Holland. This improvement in cucumbers was obtained both with gas-filled lamps and neon light.

Irradiation from 4 p.m. to 10 p.m. or from 3 a.m. to 9 a.m., *i.e.*, extending the day by six hours, gave the best results.

come in, and it has proved almost impossible to get groups of undertakers to agree to effective reorganisation. It is futile to discuss the causes of the reluctance, or to attribute blame—a thorny job for anyone to attempt.

With some small amendments of the 1919 Act conferring compulsory powers upon the Commissioners, nearly everything recommended by the McGowan Report could be done. That course seems to be subject to less Parliamentary difficulty than the carrying of a Bill fully implementing the McGowan Report recommendations. I do not suggest that the result would be so logically complete.

I may be forgiven for reminding your readers that soon after the passing of the 1919 Act I wrote in your columns that the Act gave the industry a chance to reorganise itself, and that if the opportunity were neglected, something more drastic could be expected. The opportunity was taken only to a very partial and local extent; the result was the Act of 1926, limited, however, to the generation side.

It would be a good move now for the representatives of all kinds of authorised undertakers to assure the Government that there would be no such opposition in Parliament to a measure implementing the McGowan Report—or to such an amendment of the 1919 Act as above suggested—as was offered to both the 1919 and 1926 Acts; opposition, I may add, which did not reveal anything approaching a common agreement between sections of the industry.

If nothing is done until a Government of the "left" comes into power, there is likely to be considerably more drastic action taken than that needed to implement the McGowan Committee's recommendations.

HENRY M. SAYERS.

Beckenham, *August 29th.*

Duplication of Transformers

I was interested in reading your remarks on the risks of transformer breakdown in the ELECTRICAL REVIEW of August 28th.

I suppose there are few businesses where a breakdown can be more expensive than in cinemas, where money has to be returned if the show cannot be continued.

Until quite recently, I understand, sound-reproducing equipment companies have not made it a practice to recommend the installation of standby static transformers, but just recently one of the leading companies in this field has done so, and is now recommending the installation of a second unit for all new theatres that it is equipping. In most cases, I believe, cinema exhibitors are taking the precaution of putting in a standby.

In this connection it is noteworthy that the policy of undertakings changing over from d.c. to a.c. appears to be to install a standby transformer where the exhibitor has duplicate d.c. power conversion apparatus. It would be rather interesting to hear the views of your readers on the desirability or otherwise of installing standby transformers in individual businesses.

COLIN A. SAMUELS.

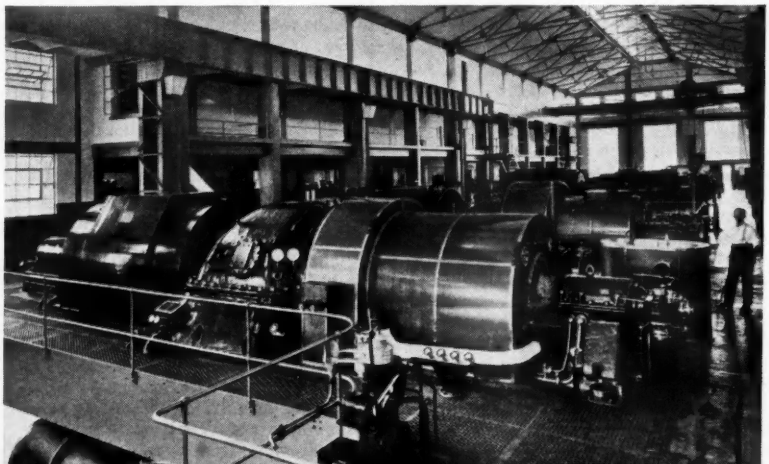
Rickmansworth, *August 31st.*

Plant Extensions at Pretoria

A new 12,500-kW turbo-alternator installed

TO meet the greatly increased load on the system the enlargement of the Pretoria municipal power station, referred to by Mr. L. L. Horrell, the city electrical engineer, in his article in the ELECTRICAL REVIEW of March 16th, 1934, has now been completed, and a new 12,500-kW (15,625-kW maximum rated), 3,000 r.p.m. B.T.H. turbo-alternator has been installed. Mr. Horrell, it is recalled, paid a visit to England two years ago, accompanied by the town clerk, Mr. M. G. Nicolson, to confer with Messrs. Merz & McLellan, the consulting engineers, with regard to the extensions.

Since the power station is situated 4,370 ft. above sea level, where the turbine house temperature may exceed 110 deg. F. and the average atmospheric pressure is equal to a 25.8 in. column of mercury, special attention has had to be paid to the design of the new plant. The turbine is of the single cylinder, single-flow type, and is provided with stainless steel blading, nozzle plates and segments throughout. The operating conditions for the turbine are 350 lb. per sq. in. gauge pressure, 650 deg. F. total temperature, the exhaust being to 2 in. absolute back pressure. The turbine is designed for feed-heating conditions and two tapping points are provided, one for supplying steam to an evaporator and the other for a feed heater. Under straight feed heating conditions, the temperature of the feed water is raised to 150 deg. F. at the economical rating. As the turbine is of the single-cylinder type, it is of minimum overall length and thus easily accommodated in the existing building; also additional losses of extra bearings and crossover pipes are eliminated, which losses would occur in the event of a multi-cylinder design.



The new 12,500-kW B.T.H. turbo-alternator at the Pretoria power station. The centrifugal oil purifier can be seen in the foreground

The turbine valve chest is arranged as a separate unit from the turbine casing, being situated side by side with the machine. This valve chest is connected by means of loop pipes to the bottom half of the turbine high-pressure casing. The B.T.H. standard system of nozzle governing is employed. A centrifugal oil purifier was supplied for filtering the turbine lubricating oil on the continuous by-pass system, and an electrical heating unit is included with this purifier so that the oil may be treated at the most suitable temperature.

The main turbine gauge panel is included and comprises a cubicle-type instrument panel approximately 8 ft. high by 4 ft. wide, completely enclosed, and with removable doors at the back. All instruments are of the flush-mounted type. The panel includes eight pressure gauges, a 12-in. diameter temperature recorder, a condensate meter including indicator and integrator, an air cooler alarm equipment, an 18-point Cambridge temperature recorder, and a "Kenotometer" vacuum gauge. The condensing, feed heating and evaporating equipment was provided by the Mirrlees Watson Co., Ltd., and a Kennicott water-softening plant is capable of treating 2,000 gal. of town water per hour and softening to a total hardness of 3 deg.

The B.T.H. Co. also supplied two 1,200-kVA outdoor-type transformers and two 30-kVA indoor-type transformers, while a small transformer was supplied for providing a suitable electricity supply for heating the turbine casing bolts for tightening purposes when assembling the turbine casings. This heating is done by inserting carbon rods through central holes in the bolts, correct tension being obtained when the bolts have cooled.

The alternator is wound for 12,000 V between phases, 80 per cent. power factor, 3 phase, 50 cycles. The direct-coupled exciter is compound wound, and includes a service exciter operating at constant voltage and supplying the shunt field of the main exciter, thus ensuring stability and quick voltage response. The alternator slip-rings and exciter are totally enclosed, and the unit is cooled on the closed circuit system by means of an air cooler, while air from the closed circuit also ventilates the slip-rings and exciter.

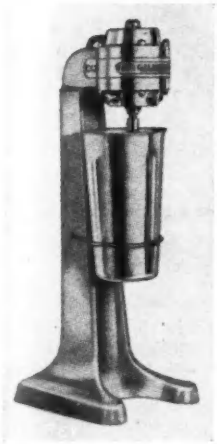
The accompanying photograph was supplied by Messrs. Wilson & Herd, Ltd., of Johannesburg, who are distributors in South Africa for the B.T.H. Co., Ltd.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Milk Bar Mixer

On account of the growing popularity of the milk bar a new drink mixer made by the A. C. GILBERT Co., 109, Kingsway, London, W.C.2, is of particular interest. Though of moderate price, it is very robustly constructed and is supplied with a large nickel-silver container. The universal motor, which has a loading of approximately 45 W, is available in all standard voltages.

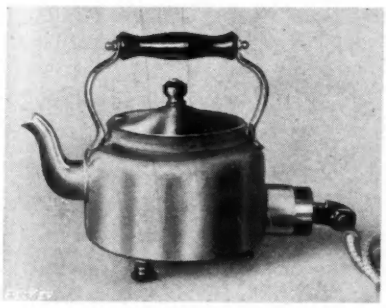


The Gilbert milk bar mixer

Electric Cooking Utensils

Several additional "Pyramid" aluminium utensils, specially designed for electric hot-plate cooking, are illustrated and described in a new edition of the booklet "The Joys of Perfect Cooking," issued by MESSRS. HAGUE & MCKENZIE, LTD., Pyramid Works, Sloane Street, Birmingham. Two smaller diameter omelette pans are now available, as well as new oval frying pans and steamers, two additional soup or stock pots, and large double porringers or milk boilers. A separate section of the brochure shows how much time and electricity may be saved by using specially designed utensils. The company emphasises that the production of aluminium ware for hot-plates is its main business and not a side line.

An Electric Kettle



The "Erco" kettle

The "Erco" kettle is a new product of the E.R. COMPANY, Bromley, Kent. It is made of heavy gauge polished aluminium and is fitted with a 1 kW, totally immersed element which can be easily removed for cleaning. The handle and feet of the kettle are made of heat-insulating material and 6 ft. of three-core flexible lead fitted with a connector completes the equipment.

Improved "Botrade" Switchgear

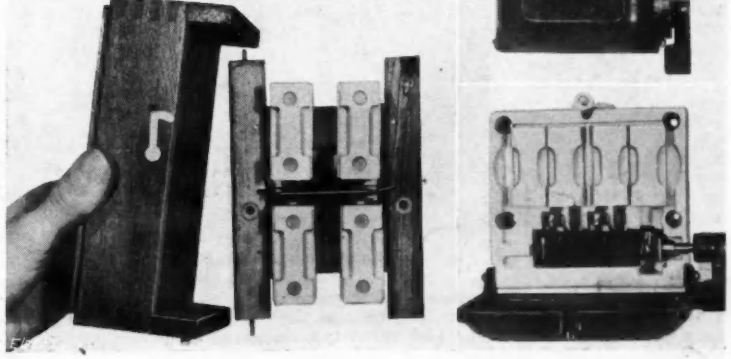
A 15-A 250-V switch-fuse, a switch splitter and improved teak fuseboards are the most recent developments by MESSRS. S. BILL & Co., LTD., Queen's Road, Aston, Birmingham.

The original "Botrade Insulok" switch-fuse was interlocked by means of a sliding cover. Improvements have now been made by fitting a hinged cover providing an interlock which automatically closes the cover as the switch is moved to the "on" position. Heavy-gauge bakelite is used for the cover and vitreous china for the base, which can be obtained in white or brown; no metal parts pass through the cover or the base.

The movement is of the standard "Botrade" type, the action being quick and positive. The brushes are of copper and are self-aligning, phosphor-bronze being used for the contact tips. The fuses are of the arc damping type designed to clear any fault without damage to the china. Phosphor-bronze contacts are used. The special arrangement of the brush allows exceptionally easy wiring and the walnut finished cover gives a neat appearance.

Another recent addition is the "hingeless" teak fuseboard, hinge-pins replacing brass hinges. Originally the pins were removable, enabling the front to be detached, but the latest patent allows the front to be taken off without removing the pins, the operation being controlled by a simple locking lever.

The "hingeless" fuseboard, (right) a closed view of a 15-A "Insulok" and switch splitter, and a 15-A switch fuse

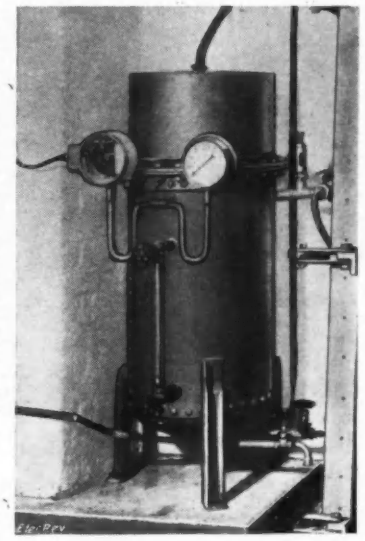


Illuminated Glass Signs

Single- or double-sided illuminated glass signs with transparent or black grounds are now being supplied by MESSRS. L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, London, W.C.2.

An Electrode Steam Raiser

The electrode steam raiser made by the GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, W.C.2, and designed for connection to a.c. three-phase supplies at 380/440 V, is particularly suitable for use in dairies. It has a shell constructed to comply with the requirements of the leading insurance companies, and is suitable for pressures up to 15 lb. per square inch, which is adequate for the average dairy. A normal maximum loading is 20 kW, with an output of about 60 lb. of steam per hr. Access to the interior for inspection and cleaning is obtainable without disturbing the adjustment of the electrode system.



A G.E.C. electrode steam raiser

The boiler fittings include inlet and outlet cock, safety valve, water and pressure gauges, and a three-pole iron-clad switch-fuse is provided for the isolation of the equipment.

Automatic control equipment can be supplied. This comprises a switch which limits the pressure to 15 lb. per square inch and a 30-A three-pole contactor with overloads; the latter can be reset by means of a push-button.

New Bulgin Accessories

A number of new electrical accessories have lately been introduced by MESSRS. A. F. BULGIN & Co., LTD., Abbey Road, Barking. These include a moulded mica dielectric pre-set condenser, a vibrator type h.t. transformer, an electro-magnetic relay, a flexible shaft coupling and many items of radio equipment such as transformers and coils, &c.

Metal Torches

A new series of metal torches has just been introduced by the GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, London, W.C.2, incorporating a number of patents. The special switching device, operated by the thumb, permits a spot or beam to be projected on any desired object; flashing, focusing and locking are all accomplished by one control. The bodies of the torches are of an attractive non-corrodible finish, in various colours, and the metal ends are heavily plated.

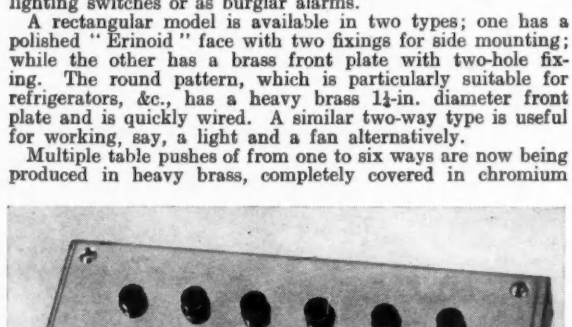
In addition to these a considerable extension has been made to the company's existing range of torches, pocket and cycle lamps, and batteries.

Lighting Accessories

Among several new lighting accessories marketed by MESSRS. FITZ-GIBBON & MURRAY, LTD., 13, Greek Street, Soho Square, London, W.1, are four neat reverse action pushes designed for incorporation in modern furniture for use as lighting switches or as burglar alarms.

A rectangular model is available in two types; one has a polished "Erinoid" face with two fixings for side mounting; while the other has a brass front plate with two-hole fixing. The round pattern, which is particularly suitable for refrigerators, &c., has a heavy brass 1¼-in. diameter front plate and is quickly wired. A similar two-way type is useful for working, say, a light and a fan alternatively.

Multiple table pushes of from one to six ways are now being produced in heavy brass, completely covered in chromium



Three examples of the new Fitz-Gibbon & Murray switches

plate, while, to meet foreign competition, a very low-priced torpedo switch has been introduced in walnut, mahogany, black, brown and red mottled finishes. New terminal blocks, finished in polished black, have deeply recessed inserts of heavy brass, eccentrically drilled.

Electric Curling Irons

Modern hairdressing fashions afford scope for the use of electricity. MESSRS. A. BONDT, 34, Lancaster Road, London, W.11, have marketed in this country a new range of hair-curling irons. These can be supplied for up to 250 V and are heated in two minutes. Nickel-plate is the standard finish, and in all except one model wooden handles with a marble finish are provided.

Two of the new Bondt curling irons

Automatic Time Switches

Several automatic time switches made by Fr. Sauter, Basle, Switzerland, have recently been introduced here by MESSRS. NATHAN AND ALLEN, LTD., 131, Victoria Street, London, S.W.1.

Type ZWO is an oil-break time switch for a.c. circuits only. The 60-A capacity is an extension of the air-break type, the air-break contacts being enclosed in an oil-bath. From 60 to 350 A, they are all of the oil-break type, fitted with a.c. squirrel-cage pilot motors which operate the contacts and also wind up the clock spring, the latter giving three days' reserve in the event of a failure in the supply. Type ZGO is somewhat similar, except that the switches are fitted with universal pilot motors, making them suitable for d.c. or a.c. circuits; they are obtainable with ratings up to 600 A.

The new "Sauter" time switches, types "ZY," "ZGO" and "ZWO"

For shop windows, signs, street lighting and water heaters a synchronous drive time switch known as the "ZY" has been developed. It is of the high-speed type mounted in a sheet-steel case, and is self-starting. This model is also made with a twelve-hour reserve in the event of a supply failure, the clock being fitted with an escapement, while a magnetically controlled brake is used to hold the escapement wheel.

Electric Clocks

Several new synchronous electric clocks have been introduced by SMITH'S ENGLISH CLOCKS, LTD., Cricklewood Works, London, N.W.2. These include the "Clinton," which has an attractive rectangular dial in a combined oak and walnut case. The "Colwyn" is similar but with a vertical instead of a horizontal dial. Another model, the "Orkney," suitable for halls, cafés, restaurants, &c., has exposed lacquered brass hands and figures, on an oak or walnut case. A combination of oak and walnut is used for the casing of the "Oldham," macassar sides being provided.

The "Orkney" clock

X-Ray Apparatus

The outstanding feature of the model "F" Victor X-ray equipment for providing full radiographic and fluoroscopic facilities is the incorporation of a Coolidge tube of extremely

The Victor model "F" X-ray equipment

fine focus and small dimensions, coupled with a special design of transformer. The X-ray tube and entire high-voltage system is oil-immersed to secure safety, and independence of the effects of humidity, altitude and temperature. The apparatus is manufactured by the VICTOR X-RAY CORPORATION, LTD., 15, Cavendish Place, London, W.1.

Combined Steriliser and Storage Water Heater

Equipment has been produced by MESSRS. A. REYROLLE & Co., LTD., Hebburn-on-Tyne, consisting of a sterilising cabinet with a water-well at the base fitted with an immersion heater, and a storage tank mounted on the top fitted with a thermostatically controlled immersion heater. A change-over switch enables either the storage tank heater or the steriliser heater to be connected; the normal arrangement is that the storage tank heater is in circuit, and the switch is changed over to the other position only when sterilising is required. The whole apparatus is lagged to conserve heat and to reduce running costs to a minimum.

The quantity of hot water stored is 50 gallons, and the loading of the storage tank heater is 3 kW, that of the sterilising cabinet varying from 6 or 8 kW, according to size.

Bakelite Lampholders

A new series of bakelite lampholders with specially large terminals for looping in with hard wires has just been marketed by LIGHTING TRADES, LTD., and the WELSBACH LIGHT CO., LTD., 51-55, Garratt Lane, Wandsworth, London, S.W.18. They are screwed for conduit and will take 3/.029 cables.

The New Season's Lamp Publicity

SINCE the publication here last week of illustrated particulars of the customary autumn publicity schemes that have been introduced by various lamp manufacturers in preparation for bigger sales during the coming lighting season, further material has reached us which will be of service to the trade.

In this matter of seasonal lamp publicity, the General Electric Co., Ltd., has had experience running over so many years and conducted on so large a scale that it has little to learn regarding what is calculated to make the best appeal to the public. Its programme for the 1936-37 season is, if possible, more extensive than in previous years. It covers "Osram" coiled-coil lamps for all general lighting purposes as well as a wide range for special lighting requirements, such as automobile lamps, architectural and decoration lamps, and lamps for sign and illuminated advertising purposes. The range of projector lamps has also been considerably extended.

"Osram" publicity and advertising will centre round the slogan "Osram—The Wonderful Lamp." A concentrated Press advertising scheme will be backed up by a series of sales aids consisting of striking showcards, cardboard cut-outs, illuminated box cut-outs and catalogues, folders and literature printed with dealers' names and addresses.

This year the "Osram" window-dressing scheme will be even more widespread, and during the E.D.A.-E.L.M.A. "Better Light—Better Sight" campaign, all displays will be arranged to tie up with the scheme.

The E.D.A.-E.L.M.A. campaign is being conducted at the expense of the makers of six well-known brands of E.L.M.A. lamps; the E.L.M.A. and E.D.A. are together incurring large expenditure upon the undertaking.

The company's lamp catalogue is one of the most comprehensive ever published, and in addition to the illustrated dealer aid literature, a handy type of salesman's pocket guide sets out concisely the various kinds of lamps.

Details of Messrs. Crompton Parkinson's plans show them to be based upon the idea of better illumination as a preventive of eye-strain, a repetition of their last year's campaign. By means of photographed faces they show in contrast on the display pieces the effects of good and bad lighting.

Four window arrangements are being offered. The main display piece is about 5 ft. square and is carried out in three colours, incorporating photographs of the heads described above, with a decorative surround, and bearing two brief slogans. Contrary to former practice, no stipulations with regard to other products displayed are imposed on the retailer, and the whole window will be dressed by the Crompton Parkinson display service men. For small windows, the centre piece can be used alone without the accompanying stage.

A box cut-out and a batch of "Osram" literature

A small coloured display incorporates two heads reproduced by natural colour photography and consists of a 3 ft. by 2 ft. showcard with a rounded base which lifts it above the level of the counter or window-base so that it will not be hidden by small objects placed in the front of it. An attractive counter card in blue and black has a pocket to hold a lamp carton.

The campaign in the shop window is to be backed by Press advertising and by a series of large neon signs; a number of these are already in operation in prominent sites in large towns. There are also two booklets for the consumer, namely, "The Crompton Story of Seeing," and "The Crompton Book of Commercial Lighting," the latter in revised form.

Other material before us this week includes further trade showcards of "Cosmos" lamps from the Metropolitan-Vickers Electrical Co., Ltd., and a booklet of 30-odd pages containing full lists of lamp prices, while the Edison-Swan Electric Co., Ltd., has issued a 50-page priced catalogue of various types of Royal "Ediswan" lamps. The company has had to extend its lamp works to meet the increased demand, and it announces that it will shortly be issuing a special brochure concerning lighting effects and lamps for floodlighting and decorative purposes required for Coronation and suchlike illumination. Pope's Electric Lamp Co., Ltd., has also sent us an illustrated and priced folder of its ordinary and special lamps.

Sight is precious
THE BETTER LIGHT OF CROMPTON LAMPS IS THE SAFEGUARD
More light with
CROMPTON LAMPS!
SIGHT IS PRECIOUS!
the better light of Crompton lamps is the safeguard

A Crompton counter card and the main window display

Points from Municipal Reports

IN our issue of August 14th we published a table of municipal supply undertakings' results for the year ended March 31st last. Progress in certain towns, however, deserves special comment. For instance, in West Ham there was an increase of 3,823 in the number of consumers, mostly domestic, bringing the total to 49,011. Altogether, 3,305 rental wiring installations were undertaken during the year. In ten years the number of domestic consumers has risen from 2,867 to 43,574, the actual amount of electricity sold for this purpose rising from 869,018 to 16,554,948 kWh.

The benefits of lower charges are exemplified in the case of Hackney, where, despite a reduction amounting to £15,000 per year in tariffs, the gross revenue was actually larger than for the previous year. A similar effect was noticeable at Southport, where lower heating and inclusive domestic tariffs resulted in increases in output of 27 and 14 per cent. respectively, helping to offset a loss of 500,000 kWh due to tramway abandonment and a further loss of consumers in the Lancashire Electric Power Co.'s area.

Many reports tell of a rapid change-over of the domestic consumers from flat rates to the two-part tariff system; at Ipswich there was an increase in the amount of electricity sold under the two-part tariff of 32.5 per cent.

Despite a decrease in population and absence of building development, a net increase in output of 17 per cent. is reported at Gainsborough, 472 new consumers being connected. At Hastings the total increase was 21 per cent., and at Burton-on-Trent 15 per cent.

New Books

Steam Turbine Operation. By W. J. KEARTON. Pp. 346; figs. 202. London: Sir Isaac Pitman & Sons. Price 12s. 6d. net.

Many books have been written dealing with the design and construction of the steam turbine (indeed, the author of the work under review has himself produced such a book which is deservedly popular), but the majority of these may be said to leave off just at the point where the practical power station engineer would wish them to begin. That is to say, they deal very fully with the scientific principles involved in the design of the turbine, such as the manner in which the heat is given up by the steam and the determination of nozzle and blade angles, but as regards the important problems inseparable from the running and maintenance of the machine they are silent.

Here, however, is a book of a different calibre, beginning with the turbine delivered on site at the power station. Although the builders may be responsible for the erection of the machine, the power station engineer will desire to familiarise himself with the details of his new unit, for the periodical overhaul of which he will be responsible at a later date. He will find in this book the methods to be adopted for aligning the shafts and subsequently testing the accuracy of the alignment; lifting the covers and the rotors; testing the clearances, and so on. The details of the lubrication, drainage, governors, glands, are all adequately dealt with, and this information, valuable to the erector, will also be essential to the operating engineer at a subsequent date.

The chapters dealing with the starting and stopping of the turbine, its maintenance, inspection and overhaul bear the imprint of the practical engineer. The turbine is often described as a very simple machine comprising merely a rotor supported in two bearings; while in comparison with, say, Diesel engines there is little to go wrong, turbo-generators are now built of such large capacity that one unit placed out of commission for a period represents a serious problem in the economy of the station as a whole. A study of this book should impart some useful knowledge of the inherent weaknesses of the turbine and the ability to detect them in the incipient stages, thus assisting the engineer not only to get the very best results in service from the turbines under his care, but to reduce maintenance overhaul costs to a minimum and also to locate and remedy troubles expeditiously.

Foundations of Technical Electricity. By E. MALLETT and T. B. VINYCOMB. Pp. 188; figs. 487. London: Sir Isaac Pitman and Sons, Ltd. Price 5s.

Soon after the applications of electricity attained practical importance the study of it extended beyond the bounds of physics. Magnetism and electricity no longer satisfied more than the needs of schoolboys. Yet, strangely enough, comparatively few changes have been effected. Although teachers were unanimous in calling for an amended syllabus, the student had usually to pass a classic course in electricity and magnetism and await the first course in electrical engineering for his introduction to many fundamental principles.

To those awaiting a book dealing with the subject in a way befitting practical requirements the present publication will be welcomed. Our one fear, and it is a serious one—if the book is intended for beginners—is whether the pendulum has not swung too far. To start with an electric current is good; also an introduction to alternating currents may even be allowed, but matters like a.c. bridges for comparing capacitances and inductances are scarcely suitable in an elementary course. Indigestion or desertion is inevitable. The ingenuity with which vector diagrams are introduced in the section on condensers in a.c. circuits calls for admiration, but such rapid progress demands sharp intellects. On the other hand, old traditions are not entirely forsaken. Why trouble young engineers with susceptibility and intensity of magnetisation? Truly ingrained habits die hard.

The foregoing blunt remarks are not intended to deprecate, but rather to emphasise the authors' praiseworthy endeavour. It is no easy task to settle what to eliminate and what to insert. If a.c. theory is introduced, how far shall we go? Is the measurement of inductance and phase angle by the three-voltmeter method permissible? If so, then a high standard is being asked from students taking their first course in electricity. Time is needed for authors and teachers to produce the best syllabus. In the present instance we suggest that the authors intend rather more than "another textbook on elementary electricity and magnetism."

There are five chapters—electric currents, condensers and electrostatics, electromagnetics—the motor effect and the generator effect, chemical action, and electric currents. At the end of each chapter class experiments are described and a number of useful problems with answers are given. In the hands of competent teachers the book will prove very useful, and we recommend it.

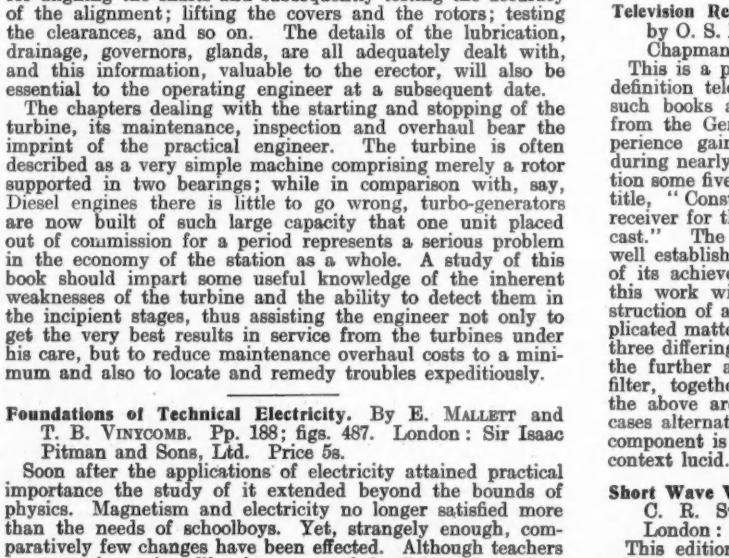
Television Reception. By MANFRED VON ARDENNE; translated by O. S. PUCKLE, A.M.I.E.E. Pp. 113; figs. 96. London: Chapman & Hall, Ltd. Price 10s. 6d.

This is a practical book detailing the construction of high-definition television receivers and is one of the very few of such books available in any language. It is a translation from the German and is based mainly on the collected experience gained from the television transmitter in Berlin during nearly two years of systematic operation and of reception some five miles distant. The author gives, as a subsidiary title, "Construction and operation of a cathode-ray tube receiver for the reception of ultra-short wave television broadcast." The virtual necessity for high definition is already well established and is here rightly emphasised, while means of its achievement is detailed step by step. The appeal of this work will be mainly to skilled amateurs, as the construction of a television receiver for high definition is a complicated matter. Besides the cathode-ray tube, itself requiring three differing voltages ranging up to 4,000 at least, there are the further additions of time-base apparatus and amplitude filter, together with a well-designed short-wave aerial. All the above are fully described with complete, and in many cases alternative, circuits; also the value of practically every component is tabulated. The illustrations are good and their context lucid. The book should be widely appreciated.

Short Wave Wireless Communication. By A. W. LADNER and C. R. STONER. (Third edition.) Pp. 453; figs. 248. London: Chapman & Hall, Ltd. Price 21s. net.

This edition is 25 per cent. larger than the first edition, which appeared less than four years ago, and brings up to date the information given in the second edition at a time when short-wave technique is becoming of first importance, due to the advent of television and the rapid development of commercial ultra-short-wave circuits. The text of the last edition has been revised, and a chapter added on commercial wireless telephone circuits. In the earlier editions nearly all the text was based on the practice of the Marconi Company, which was indeed the pioneer in commercial short-wave working, but the authors have now gone farther afield and included more information on the practice of others, including the British Post Office.

It is thus a first-class summary of the whole subject, transmission, reception and wave propagation, both from the theoretical and practical sides, making use of simple mathematics only. For those who require more detailed information on the matters dealt with, there are selected references at the ends of chapters. This book is the best yet published on short-wave working, and should have a wide welcome from all interested in the technical aspects of wireless communication.



The presentation of the Moffat cup to Mr. R. H. Harral (electrical engineer and manager, Blackburn) (see page 315)

Left to right: The Mayoress (Mrs. W. Coupe), the Mayor (Mr. W. Coupe, J.P.). Ald. C. A. Critchley, J.P. (chairman of the Blackburn Electricity Committee), Mr. R. H. Harral and Mr. E. S. Smith (managing director, Moffats, Ltd.).

Shorter Notices

"Problems in Radio Engineering," by E. T. A. Rapson. (Second edition.) Pp. 103; figs. London: Sir Isaac Pitman and Sons. Price 3s. 6d. net. The problems which are dealt with were collected and classified to facilitate the class-work in radio engineering which forms part of the course for the higher national certificate in electrical engineering developed at Southall Technical College, and advantage has been taken in preparing a second edition to add the latest examination questions, to amplify some of the introductory notes and to include references for further reading for the convenience of private students.

"Die Technik Selbsttätiger Steuerungen und Anlagen," by G. Meiners. Pp. 225; figs. 144. Berlin: R. Oldenbourg. Price Rm.12.50.

"Modern Radio Communication—Vol. 1," by J. H. Reyner. (Sixth edition.) Pp. 330; figs. 157. London: Sir Isaac Pitman & Sons, Ltd. Price 5s. net.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

New Factories in 1935

A "Survey of Industrial Development, 1935," produced by the Board of Trade (Stationery Office, 9d. net), contains details of new factories opened during the year and of factories closed. The total number of factories opened in Great Britain as a whole was 510, employing 49,750 people, while 192 factories were extended. In the same period 486 factories were closed. Eighty of the new factories represented transfers from other areas, and 58 of these were in Greater London—the majority being merely transfers from one district to another. The survey provides no evidence of a "drift of industry to the South," the net movement actually being in the opposite direction. The greatest number of new factories were in the clothing industry; textile factories came next and the engineering industry was third with 48 new factories and 32 extensions of existing ones. In the electrical engineering group 25 new factories were opened and there were 14 extensions, the bulk of them being in the Greater London area. Ten of the new works are engaged in the manufacture of radio apparatus, dry batteries, &c., four in the production of domestic appliances, and eleven in general electrical engineering or the manufacture of other products. Nineteen factories were closed, thirteen of them being engaged in radio apparatus and dry battery production; eleven of the closures were on account of transfer.

The E.T.U. Congress

At the annual congress of the Electrical Trades Union held at Scarborough last week one of the subjects discussed was the amalgamation of the union with a larger union, but a resolution rejecting the proposal was carried. The conference decided to recommend the executive committee to consider the formation of an industrial section for men and women, chiefly with a view to enrolling workers in the radio industry. The executive committee was also recommended to proceed with the negotiations relating to apprentices and boy labour with a view to regulating the age of entry into the trade, wages and registration.

A Consumers' Booklet

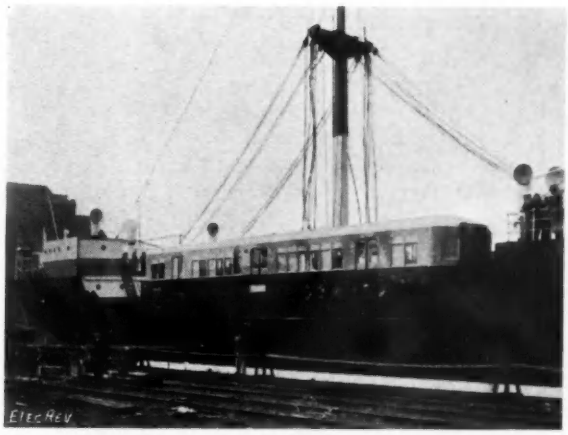
We have received from Mr. J. Duncanson, A.M.I.E.E., 16a, Blythswood Sq., Glasgow, copies of a booklet which he has prepared entitled "Electricity in the Home—and Your Safety." This is a simple exposition of the action of electricity in lighting, heating and cooking and the nature of electrical installations. The third chapter warns the reader against tampering with his electrical installation, while stressing the fact that electricity is not dangerous. The renewal of section fuses is explained and the booklet concludes with advice to consult the electricity supply authority upon matters relating to tariffs and apparatus. It is thought that the booklet will be of service to supply authorities and contractors and the inside of the back cover contains an announcement beneath which the name of the company, corporation or individual can be printed. The price for a minimum quantity of 500 overprinted booklets is 10s. per hundred.

Japanese Electrical Manufacture

The latest factory statistics relating to the Japanese electrical manufacturing industry (compiled by the Ministry of Commerce and Industry) are reviewed in the August circular of the Mitsubishi Research Bureau. The returns show that between 1929 and 1934 the total production of electrical machinery and apparatus in Japan rose in value from 195,878,000 yen to 257,377,000 yen. For last year the total is estimated to have been 280,000,000 yen. The rise was not consistent over these six years, as 1930, 1931 and 1932 all showed a lower level than 1929, but in the case of two branches of the trade it was continuous. The manufacture of wireless apparatus increased steadily from 4,715,000 yen in 1929 to 26,421,000 yen in 1934, and of meters from 2,129,000 yen to 7,248,000 yen in the same period. The development of electrical engineering in Japan during the past few years is attributed largely to the great increase of the export trade since the reintroduction of the gold embargo, as well as to the expansion of the domestic demand for electrical machinery and equipment for the armament and other industries, particularly as the low rate of the yen exchange has checked imports from former sources. The Mitsubishi Bureau calculates that the ratio of imports to home demand is now less than 2 per cent., whereas six years ago it was 8½ per cent. It mentions a 50,000-kW turbo-alternator at the Tokyo Electric Power Co.'s Tsurumi plant and a 40,000-kW installation of the Kyodo Electric Power Co. which, together with many other machines of equal or approximate size, have, it states, been successfully manufactured in Japan. Reference is also made to a 63,500-kVA transformer under construction by the Shibaura Electric Manufacturing Co. The manufacture of dynamos, motors and transformers rose respectively from 7,914,000 yen, 16,033,000 yen and 12,331,000 yen in 1929 to 11,244,000 yen, 34,751,000 yen and 15,400,000 yen in 1934. Another branch of electrical manufacture which has shown progress (particularly in export) is insulated wire and cables. The output of these totalled 57,967,000 yen in 1929 and 59,000,000 yen in 1934, while exports increased five-fold between 1932 and 1935. The Mitsubishi Bureau mentions the formation by three companies of a joint concern for making submarine cables. Other new lines of production undertaken during the past two or three years are heating wire, electric welders, and vacuum tubes. Exports of lamps have decreased somewhat on account of import restrictions in foreign markets, but the expansion in the domestic demand is said to have more than offset the export loss.

Electrical Rolling Stock for Brazil

The first three-coach train of the seventy-nine similar units being built by the Metropolitan-Vickers Electrical Co., Ltd., for the suburban electrification of the Central Railway of Brazil was loaded at Birkenhead on board Messrs. Lamport & Holt's steamer, s.s. *Bonheur* on August 24th. An 87-ton crane was used for the loading, and the unit was carried on deck, completely assembled with all electrical gear and on its own bogies ready for service. The motor coach weighs



One of the Met.-Vick trailer coaches on the special rails on the deck of s.s. "Bonheur" ready for shipment to Brazil

fifty-six tons, and each of the two trailers thirty-four tons. Each coach is 68 ft. 10¼ in. long and 10 ft. 2½ in. wide; the motor coach is 14 ft. 2⅝ in. high, and the trailers 13 ft. 1½ in. high. This shipment forms part of a £3,000,000 order, and regular shipments will be made until August, 1937.

Soviet Electrical Troubles

The heavy industries section of the Soviet Central Executive Committee recently carried out an investigation of the "Elektro-apparat" works in Leningrad, where high-voltage apparatus has been made. This step followed complaints regarding the quality of the output of this concern which, according to the report of the investigation, has greatly deteriorated. For example, it is stated that "Elektro-apparat" turned out an oil-break switch of 1,500 megavoltamperes the weight of which was four times that of a foreign switch of equal rating, namely, 23 tons instead of 5½ tons; and that it required forty-two times as much oil (11 tons instead of 265 kg.) as the foreign article. On account of the lack of dynamic stability of the oil-break switches manufactured by "Elektro-apparat," Government users allege that they have had to install 1,000 A types where normally 200 or 300 A would have been adequate, and transformers of 750 to 1,000 A where otherwise they would have put in apparatus of 300 to 400 A. It is also stated that no improvement has been made in certain types of switches for ten years.

The Moffat Window Display Competition

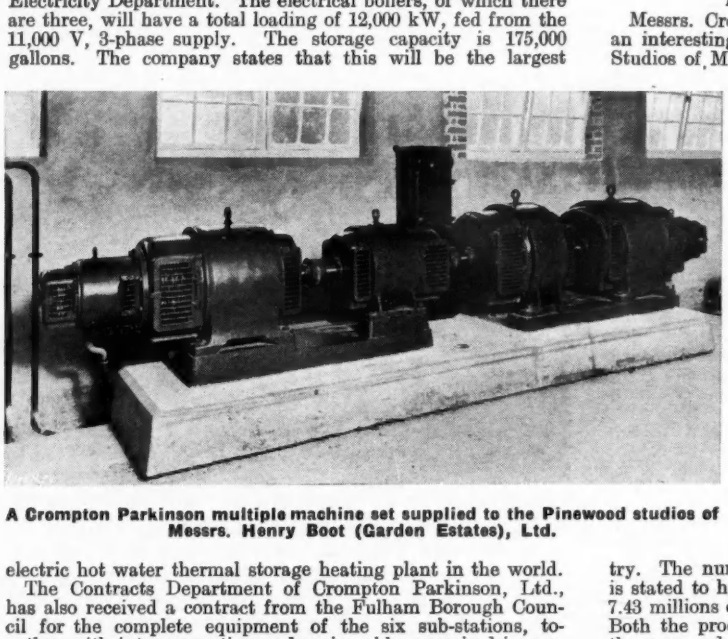
Messrs. Moffat, Ltd., entertained the Mayor of Blackburn, members of the Corporation, and other prominent visitors on August 25th to mark the success of the Blackburn electricity undertaking in winning a silver trophy presented by the company in a recent national window display competition. Those present included Messrs. E. S. Smith (director), R. Smith, A.M.I.E.E. (sales engineer), W. R. Drummond (secretary), J. Heard (works manager), Ald. C. A. Critchley, J.P., and Councillor G. B. Eddie, chairman and vice-chairman respectively of the Blackburn Electricity Committee, Messrs. J. Taylor (solicitor to the company), F. J. Roe, of Manchester (one of the judges), and R. H. Harral (electrical engineer and manager of the Blackburn electricity undertaking). The Mayor of Blackburn (Mr. W. Coupe, J.P.) formally presented the cup and a cheque

for £50, which were accepted by Mr. Harral on behalf of the Department. The cheque is to be applied to the Benevolent Fund of the undertaking. Ald. Critchley said Blackburn was proud of the advancement which the undertaking had made under Mr. Harral's direction. Coun. G. B. Eddie proposed the toast of Messrs. Moffat, Ltd., which, he said, had been established for fifty-three years and had manufactured electric cookers since 1914. Mr. Taylor, responding, mentioned that the New Zealand business of the company was gradually changing over to the plant manufactured in Blackburn, and for two years an average of 300 cookers per month had been shipped to that country from Blackburn. He understood that there were 32,000 Moffat cookers in New Zealand, 40,000 in South Africa, 12,000 in the Irish Free State and over 30,000 in Australia. A photograph showing the Mayor presenting the cup to Mr. Harral is reproduced on page 314.

Orders Recently Booked

In connection with the new lighting which is being installed at the Central Criminal Court (the Old Bailey), the D.P. Battery Co., Ltd., is supplying the emergency lighting installation comprising a D.P. battery of 210 cells having a capacity of 200 Ah, motor generator and switchboard.

The contract for the electrical thermal storage equipment for heating Earls' Court Exhibition has been placed with Messrs. Bastian & Allen, Ltd., by the Fulham Corporation Electricity Department. The electrical boilers, of which there are three, will have a total loading of 12,000 kW, fed from the 11,000 V, 3-phase supply. The storage capacity is 175,000 gallons. The company states that this will be the largest electric hot water thermal storage heating plant in the world.



A Crompton Parkinson multiple machine set supplied to the Pinewood studios of Messrs. Henry Boot (Garden Estates), Ltd.

The Contracts Department of Crompton Parkinson, Ltd., has also received a contract from the Fulham Borough Council for the complete equipment of the six sub-stations, together with interconnecting and main cables, required in connection with the new Earl's Court Exhibition. The sub-stations will be situated in different parts of the Exhibition at the appropriate load centres. The contract covers the entire electrical equipment, including thirteen transformers, high-voltage and low-voltage switchgear, and 1,600 Ah storage battery, 188 kW motor-generator set, d.c. switchgear, central alarm and telephone equipment, fire-fighting equipment for each sub-station, three 100-kW mercury arc rectifier equipments, and the whole of the main and auxiliary cables. The incoming supply is 11,000 V, 3-phase, 50 cycles, which is transformed down to 400/230 V, 4-wire. The stand-by plant produces 230 V d.c.

Television Receiver Prices

The General Electric Co., Ltd., has fixed the prices of its two television receivers as follows:—Sound and vision model, 95 guineas; sound and vision model combined with 8-valve all-wave broadcast receiver, 120 guineas.

The Chocolate and Confectionery Exhibition

At the Chocolate and Confectionery Exhibition now being held at Olympia, London, it is obvious that the sweet-making industry, like most others, is becoming more and more dependent on electricity for its operation. Apart from its use in display lighting, electricity is now employed almost exclusively for driving, and for certain purposes heating, all machinery used in the up-to-date factory. This year particular attention seems to have been paid to developing apparatus for minimising wastage of wrapping materials. Messrs. Baker Perkins, Ltd., for example, have incorporated in their "Universal" twist and fold wrapping machine a photo-electric device for regulating the speed of the wrapper-feed mechanism. A similar saving of wrapping materials is effected by mechanical means in a 60 piece per minute interchangeable two-stage chocolate wrapping-machine demonstrated by Messrs. Paillard & Benoit (S.I.F.) Wrapping Machines, Ltd.; this apparatus can take either band or envelope type wrappers and it stacks up the packets in vertical racks. Another foil economiser shown by Messrs. Max Loesch makes use of a diagonal wrap. Two new machines appearing for the first time on the stand of Messrs. Rose Bros. (Gainsborough), Ltd., are the 750 per minute "R.A.F." plastic twist wrapper and the 140-160 per minute "I.S.T." irregular twist wrapper, while the Benhil Machinery Co., Ltd., is demonstrating a number of "Hoeller" filling and packing machines. For mixing and boiling caramel, Messrs. Norman Bartleet, Ltd., introduce a new vertical mixing pan with a foot-controlled two-speed self-contained drive in the base; the method of operating obviates the necessity for raising or lowering the paddles when filling or emptying. The "Bindler" vertical cooling conveyor and the automatic tempering machine incorporating electric thermostats are other new items shown by this company, which also makes continuous caramel cutting machines and a solid centre chocolate moulding machine. Cellophane wrapping machines practically all incorporate small electric heaters for sealing, and an interesting model is shown by Messrs. Bramigk & Co., Ltd., who also have electrically operated cocoa and chocolate refiners and an entirely new specific gravity separator for cocoa beans. The "Bauermeister Automaton" chocolate mill (F. Jahn & Co.) will make vanilla chocolate mass continuously at the rate of 5 cwt. per hour. For colorimetric analysis of materials the apparatus made by Tintometer, Ltd., is finding increasing use. The exhibition closes next Thursday, September 10th.

Plant for the Pinewood Studios

Messrs. Crompton Parkinson, Ltd., have recently supplied an interesting multiple machine set for use in the Pinewood Studios of Messrs. Henry Boot (Garden Estates), Ltd. The set comprises a 19 h.p. 400 V 50 cycle unity p.f. auto-synchronous motor, a 7 kW 100 V d.c. generator, a 31 h.p. 230 V shunt wound d.c. motor, and a 230 V 60 cycle alternator. In normal operation the auto-sychronous motor is the driving unit and the d.c. motor runs free. In this condition the set provides a 100 V d.c. supply and a 60-cycle 230 V a.c. supply, the latter being required for the sound recording and other machines. In the event of a failure of the 230 V a.c. supply the d.c. motor fed from a suitable d.c. supply is brought into action to drive the set. The auto-synchronous motor then acts as an alternator to provide a 230 V 50-cycle supply, the 110 V d.c. generator and the 60-cycle alternator running as before. The four machines are flexibly coupled together and mounted on two bedplates. The concrete base itself is mounted on rubber strips which prevent vibration being transmitted to the floor.

The German Radio Trade

The opening of the Wireless Exhibition in Berlin has afforded an opportunity for the publication of statistics concerning this industry. The number of subscribers to the broadcasting stations is stated to have risen from 6.52 millions on July 1st, 1935, to 7.43 millions on July 1st last, or from 36 to 42 per 100 houses. Both the production and sale of receiving sets diminished in the year ended June last. The production fell from 1,996,726 in 1934-35 to 1,258,179 in 1935-36, and the sales from 1,939,174 to 1,388,098, the decrease applying both to standard products and to the cheap national receiver. On the other hand, there has been some development in the export trade. The value of the exports of apparatus for wireless telegraphy and telephony amounted to as much as 78.2 million Reichmarks in 1930 and 1931, but it receded to 44.29 millions in 1932, 29.40 millions in 1933, and further to 26.93 millions in 1934 and 26.6 millions in 1935. During the first half of the current year the export values were 11,013,000 marks, as compared with 9,301,000 marks in the same period in 1935 and 11,148,000 marks in that in 1934. The chief buyers are Holland, Sweden, Italy and France in the order mentioned. The imports in the first six months totalled 1,840,000 marks, as compared with a total value of 3,240,000 marks in the corresponding period of last year.

Welding Rods Approved

Lloyds' Register of Shipping has approved the Philips type 40 welding rods, these having met the requirements of the Society's rules for the application of electric arc welding to ship construction.

For Sale

The Salford Electricity Department has for disposal motors and control gear and an exhaust fan.

Plymouth Corporation invites offers for the purchase and removal of two 3,000-kW turbo-alternators.

(See our classified advertisements.)

The Cheshire Agricultural Show

At the Cheshire Agricultural Show which was held yesterday (Thursday), the Chester Corporation Electricity Department had a stand displaying motors, shearers, clippers, pumps, bottle washers, milk coolers, refrigerators, greenhouse and soil heaters, incubators and electric water heaters. There were also demonstrations of cooking various potato dishes by electricity, held under the auspices of the Potato Marketing Board, together with an advisory bureau demonstrating the latest electrical appliances.

Dutch Electrical Imports and Exports

From the Dutch official trade returns for the half year ended with June last we have compiled the appended tables for electrical machinery and allied goods. For purposes of comparison the Dutch guilders have been converted into sterling at the rate of 7.5 to the £.

	Imports. Jan.-June, 1935.	Imports. Jan.-June, 1936.	Exports. Jan.-June, 1935.	Exports. Jan.-June, 1936.
	£	£	£	£
Electricity generators and parts ...	141,600	46,400	9,600	12,935
Electric motors and parts	63,200	67,200	50,535	50,000
Radio sets and parts	533,065	442,000	2,266,535	1,475,065
Telegraph and telephone material ...	274,135	224,000	14,625	12,665
Electric vacuum cleaners and parts ...	41,065	59,865	4,535	8,665
Electrical measuring instruments and parts	460,400	362,335	142,400	279,735
Insulated wire and cables	159,865	151,600	78,800	91,735
Electric lamps under 16v.	23,865	16,935	289,600	243,735
Electric lamps over 16v.	6,135	7,200	60,935	60,665
Other electric lamps	1,465	1,465	14,935	18,800
Bulbs for electric lamps	6,665	5,200	62,935	75,600
Electric and other refrigerators and parts	15,335	22,800	535	265
Totals	£1,726,795	£1,407,000	£2,995,970	£2,329,865

An analysis of the import figures shows that the principal supplying countries were Germany, Belgium, the United States, Great Britain, Switzerland, France and Sweden in that order. Of the electric motors, Germany is credited with £23,600, the United Kingdom's share being £2,000. As regards radio sets and parts, Germany is in the first place with £190,025, Great Britain being second with £52,015 followed by Belgium with £42,935. Germany is credited with £151,735, or nearly 70 per cent. of the telegraph and telephone material. Germany and Sweden control the bulk of the trade in the imported vacuum cleaners, and the former country leads in imports of electrical measuring instruments with £273,865, Switzerland coming next with £40,265, followed by Great Britain with £11,065. In the case of electric wires and cables, over 80 per cent. (£124,000) is attributed to Germany with small quantities from Belgium, Czechoslovakia, the United States and Great Britain. The electric lamps are mainly supplied by Germany, Hungary, Austria and Belgium and the bulbs by Belgium and Germany, while the refrigerators are mainly of American origin. The returns are not so informative with regard to exports. For electric generators, the principal markets were the Dutch East Indies and Argentina, and for motors they were the first-named country, Germany, Belgium, Spain and South Africa.

A Crompton Wholesalers' Conference

About forty people were present at an all-day conference of wholesalers held at the invitation of Messrs. Crompton Parkinson, Ltd., at the Trocadero Restaurant on August 31st. Mr. T. H. Windibank, who is in charge of the Crompton Parkinson lamp and v.i.r. cable sales department, presided, and outlined the plan of campaign for the forthcoming year. New developments include the introduction of a range of Crompton lighting units for commercial and industrial lighting, and a special decorative lighting unit to be known as "Striplet," of which large stocks will be available in good time for the Coronation. Speaking of the past season Mr. Windibank reported a very large increase in the total sales of Crompton and Kye lamps, particularly the coiled-coil type. He stated that part of the new factory at Guiseley was already in production, and that new lamp factories were now being built overseas. Dealing with the forthcoming campaign, details were given of the plans which had been made to increase still further the personal efficiency of the sales force by means of a special training school, and a competition with substantial cash prizes.

Free State Restricts Lamp Imports

An Order prohibiting the importation, save under licence, of certain types of electric lamps has been issued by the Executive Council of the Irish Free State Government. The lamps referred to are those "constructed for use in an electric circuit at not less than 100 volts nor more than 250 volts and consume not less than 20 watts nor more than 500 watts and are fitted with a bayonet cap or screw cap." Lamps of certain types set out in the Order are exempt from the prohibition. The first quota period in respect of the Order commences on October 5th. The types exempt from the prohibition are carbon-filament lamps, cylindrical lamps, candle lamps, electric-discharge lamps, and lamps for medical, scientific and surgical purposes.

Good Lighting

The Benjamin Electric, Ltd., has produced a publication entitled "Use Your Eyes," which is particularly addressed to works owners and employers of labour, in an endeavour to create interest in the important subject of better lighting in industry. This booklet deals with Benjamin planned lighting, and points out the many advantages of efficient illumination. A number of illustrations are included showing various works in which Benjamin industrial lighting equipment has been installed.

"Clesco" Garden Party

Fine summer weather favoured the 20th annual horticultural exhibition and garden party of the County of London Electric Supply Co.'s Sports and Social Club last Saturday. In addition to the horticultural exhibition and sports there were variety concerts, and, later in the evening, dancing. There was a record attendance. Lady Askwith distributed the prizes.

Trade Announcements

Messrs. L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, London, W.C.2, inform us that they have re-established their former arrangements whereby they are sole distributors of "Universal" electrical appliances and are producing a new catalogue of these.

Messrs. Ripaults, Ltd., have moved their works to Southbury Road, Enfield.

Messrs. Jessop & Boydell, Ltd., electrical engineers and contractors, have removed to 7, Drewton Street, Manningham Lane, Bradford, and ask for manufacturers' lists.

We are asked to state that the business of Messrs. H. A. Jackson & Co., electrical wholesalers, of Chapel Street, Salford, has been purchased by Mrs. Mary H. Jackson, and will be continued under the management of Mr. Robert Ramsden at the same address.

Ensign Lamps

Ensign Lamps, Ltd., of Preston, report increased production of lamps for the lighting season and preparations for meeting demands for striplite and tubular lamps. They are using public hoardings for poster display and have added colour-sprayed sign type lamps to the Ribble range in all colours.

Bakers' and Confectioners' Exhibition

The fortieth Bakers' and Confectioners' Exhibition opens to-morrow (Saturday) at the Royal Agricultural Hall, Islington, N.1, and will continue until next Friday. Several well-known electrical companies are participating.

Prices of Materials

Messrs. Henry Gardner & Co., Ltd., report, September 2nd: No change in the price of copper bars (best selected), sheet and rod and English pig lead. Spelter £13 11s. 3d., 2s. 6d. increase. English block tin £188 10s., £5 10s. increase.

Messrs. Edward Till & Co. report, September 2nd: No change in the price of India rubber, Para fine.

A Window-dressing Competition

The annual "selling fortnight" of the Ever Ready Co. (Gt. Britain), Ltd., will commence on September 28th. Prizes to the value of £1,000 are offered for window displays, and goods to the value of £1,000 will be given as prizes to attract customers.

Siemens "Sieray-Dual" lighting in the extension to the West Riding Auto Company's garage at Wakefield

New Catalogues and Lists

Holophane, Ltd., Elverton Street, Vincent Square, London, S.W.1.—A booklet dealing with bulkhead and flameproof fittings.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.—A booklet on insulating and protective tapes.

Cambridge Instrument Co., Ltd., 45, Grosvenor Place, London, S.W.1.—A catalogue of distance thermometers for temperatures from −330 deg. to +1,000 deg. F.

British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C.4.—"Aluminium Production, Properties and Applications" is the title of the company's latest publication.

James Neill & Co., Ltd., Composite Steel Works, Napier Street, Sheffield, 11.—Details of an improved magazine hacksaw frame.

Arora Co., Loughborough.—A leaflet describing the "Projector" series of fires.

Switchgear & Equipment, Ltd., 90/96, Cannon Street, London, E.C.4.—Details of self-reclosing circuit-breakers.

Aeronautical & General Instruments, Ltd., Purley Way, Croydon.—Details of "Airflo" renaissance radio receivers.

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.—A radio manufacturer's catalogue of condensers and resistances and a smaller version for the general public.

Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1.—A catalogue of new season's electric fires.

A. H. Hunt, Ltd., Bendon Valley, Garratt Lane, Wandsworth, S.W.18.—A catalogue of fixed condensers of all types and sizes.

G. Bray & Co., Ltd., Leeds, 2.—A complete new illustrated catalogue of elements and heating equipment.

Unity Heating, Ltd., Vincent House, Vincent Square, Westminster, London, S.W.1.—A complete new catalogue of electric heating equipment.

Bankruptcy Proceedings

F. L. Hawdon (trading as Locksley & Co.), electrical and radio engineer, 27a, Sale Street, W., and lately of 109, Star Street, W.—This debtor petitioned the London Bankruptcy Court on August 13th and was adjudged bankrupt the same day. The statutory first meeting of creditors was held on August 26th, when accounts were submitted showing liabilities of £617 against assets of £35. The failure is attributed to insufficient capital and depression in trade. The case was left in the hands of the Official Receiver to be wound up in bankruptcy.

J. Freeman (married woman), trading as Albion Electrical Co., Albion Works, Lampeter Street, N., manufacturers of electrical appliances.—The statutory first meeting of creditors was held on August 31st at London Bankruptcy Buildings, and in the absence of the debtor was adjourned for one week. The receiving order was made on the petition of Allbright Electrical Co., Ltd.

S. Allen, electrical engineer, 43, Fossgate, York.—First meeting September 4th at 17, High Ousegate, York. Public examination September 24th at the Law Courts, York.

A. Ambrose, electrical engineer, 137, Market Street, Chorley.—First and final dividend of 3s. 10½d. in the £, payable September 4th at 9, Fox Street, Preston.

L. S. Walter, electrical engineer, 48, Broad Street, Banbury.—First and final dividend of 3s. 7¾d. in the £, payable September 4th at 8, Forbury, Reading.

Company Liquidations

British Electrical & Engineering Co. of China, Ltd.—Winding up voluntarily. Liquidator, Mr. C. C. Baker, Spencer House, South Place, E.C.

Burrell Radio, Ltd.—Meetings September 30th at 185-188, High Holborn, W.C., to receive an account of the winding-up by the joint liquidators, Messrs. C. Latham and F. H. Harper.

Emerson Electric Co., Ltd.—Meetings October 8th at 255, West End Lane, West Hampstead, N.W.6, to receive an account of the winding-up by the liquidator, Mr. S. F. Homewood.

London Nigerian Power Co., Ltd.—Meetings September 30th at 55-61, Moorgate, E.C.2, to receive an account of the winding-up by the liquidator, Mr. A. M. Lightman.

C. H. Hazzlewood, Ltd.—Winding up voluntarily. Liquidator, Mr. F. Hartley, Atlas Chambers, King Street, Leeds.

Greater London and Counties Trust, Ltd.—Winding up voluntarily. Liquidator, Mr. E. J. Harrison, 11, Waterloo Place, S.W.1.

Warwickshire Electric Refrigerator Co., Ltd.—Meetings October 2nd at Kingham Chambers, Abington Street, Northampton, to receive an account of the winding-up by the liquidator, Mr. R. V. Summers

Private Arrangements

Mrs. G. M. Goodban, 111, Burley Lodge Road, Leeds, wireless dealer, &c.—The creditors herein met recently at the Hotel Metropole, Leeds, when the statement of affairs showed ranking liabilities of £956 of which £675 was due to the trade, and the balance of £281 to the bank. In addition there was a cash creditor for £331 who was not ranking. The total assets were £895, leaving a deficiency of £61. In addition to the liabilities shown in the statement of affairs there was a contingent claim in respect of hire purchase agreements amounting to approximately £900. It was decided that a deed of assignment should be executed to Mr. H. R. Tebb and Mr. F. E. Bendall, as joint trustees, together with a committee consisting of three of the creditors. It was also decided that the trustees should be empowered to re-sell the assets for a sum sufficient to pay 20s. in the £.

W. G. Hunt, 41, Albert Road, Southsea, electrical contractor.—At a meeting of the creditors herein the statement of affairs showed ranking liabilities of £573. The assets were £250, and they were subject to preferential claims of £44. The present position was attributed to lack of capital and pressure by creditors. A deed of assignment had already been executed to Mr. W. C. Black, of 17, King's Terrace, Southsea, and a resolution was passed confirming that deed, while a committee of three of the largest creditors was also appointed.

Electricity Supply

Lighting, Domestic, Power

Bath.—11-kV CABLES MOVED.—To enable work to proceed on the reconstruction of the North Parade bridge it recently became necessary to move two 11-kV cables which supply electricity to North-West Wiltshire. The two heavy cables were successfully repositioned by a gang of eight men without the supply being interrupted.

Bedwellty.—LOAN.—Sanction has been received by the Urban District Council to a loan of £2,360 for electricity purposes.

Blackpool.—SUPPLY TO A CLAY PIT.—The Council has agreed to a supply of electricity being given to a clay pit at North Shore by underground cables.

ILLUMINATIONS.—Sir Josiah Stamp will switch on the illuminations on September 12th from Oxenholme railway station, near Kendal, more than 40 miles away. His speech will be relayed by telephone to Blackpool and broadcast by loudspeakers outside the Town Hall.

Boston.—COMBINED TRANSMISSION AND DISTRIBUTION LINES.—The Boston and District Electric Supply Co., Ltd., has recently put into service some combined h.v. and l.v. overhead lines, erected by British Insulated Cables, Ltd. These lines, which serve a sparsely populated agricultural area, are supported on single wooden poles, with 150 ft. spans, and run along the side of the roads. The 11-kV conductors of the rural transmission system are in triangular formation at the top of the pole, with a longitudinal earth conductor immediately below them. Under this earth conductor are the l.v. lines arranged in vertical formation. The l.v. supply is 460/230 V, single-phase, 3-wire, with provision for conversion at a later date to 3-phase, 4-wire by the addition of a fourth line. The 11-kV conductors are of cadmium copper and the earth and l.v. conductors of copper.

Combined h.v. and l.v. overhead lines at Gedney, Lincs

Bournemouth.—SUB-STATION.—The Bournemouth & Poole Electricity Supply Co., Ltd., is to erect a sub-station in Bengal Road.

Bridgend.—IS RADIO LIGHTING OR POWER?—The action of the Council in forbidding the use of power circuits for radio sets has resulted in considerable dissatisfaction. Not only is Bridgend affected by this decision, but also a large area (including Kenfig Hill, Aberkenfig, Laleston and Coity) outside the town. Public meetings are being held to discuss the matter and several ratepayers have intimated that they are prepared to test the the legality of the Council's action, on the grounds that the electricity used by radio sets cannot be regarded as lighting energy.

Bristol.—CROSSING THE AVON.—Last week a pipe was laid across the River Avon at Broad Pill, Avonmouth, for the accommodation of the new 33,000-V cables between the Portishead generating station and Bristol. The pipe line was welded in position on a wooden structure over the river by the suppliers of the pipe, the Newport & South Wales Tube Co., Ltd., the ends being blank-flanged to prevent water entering. The ends of the pipe are uncovered at low tide and the mid-stream section, 530 feet in length, is now safely in position. Siemens Brothers, Ltd., Woolwich, are providing the cables and evolved the method of crossing the river.

Burnley.—CHANGE-OVER.—Application has been made by the Town Council for sanction to borrow £25,000 to meet expenditure on the change-over from d.c. to a.c. in various parts of the town. To date £104,000 has been spent in connection with the change-over, and it is estimated that before completion of the scheme another £30,000 will be required, in addition to the £25,000.

Canada.—MORE ELECTRICITY PRODUCED.—The output of the central electricity stations during the first six months of this year was 9.3 per cent. above that for the corresponding period of 1935, continuing the gradual improvement that has been going on the past few years, states *Reuter's Trade Service* from Ottawa. Canada has now harnessed about 18 per cent. of its available surveyed water power. Plants already constructed have a capacity of 7,900,000 h.p. and the surveyed resources are capable of producing 43 million kWh.

Epping.—EXTENSIONS.—The County of London Electric Supply Co., Ltd., is to extend its mains at Epping Green.

Garstang (Lancs).—SCORTON AND CABUS SUPPLIES.—The Council has been notified that it is not the intention of the Preston Electricity Committee to extend its mains to Scorton or part of Cabus unless the Council guarantees to use or pay for an amount of electricity that would provide a certain definite minimum revenue for a period of five years.

Guisborough.—UNDERGROUND CABLES.—Consideration is being given by the Electricity Committee to a scheme for the laying of an underground cable in the Bolckow Street area at a cost of £1,174.

Hailsham.—OVERHEAD CABLES.—In view of representations by the Rural District Council the Weald Electricity Supply Co., Ltd., has abandoned a proposal to erect high voltage overhead lines to Foxhunt Manor, Waldron, and the cables will be laid underground.

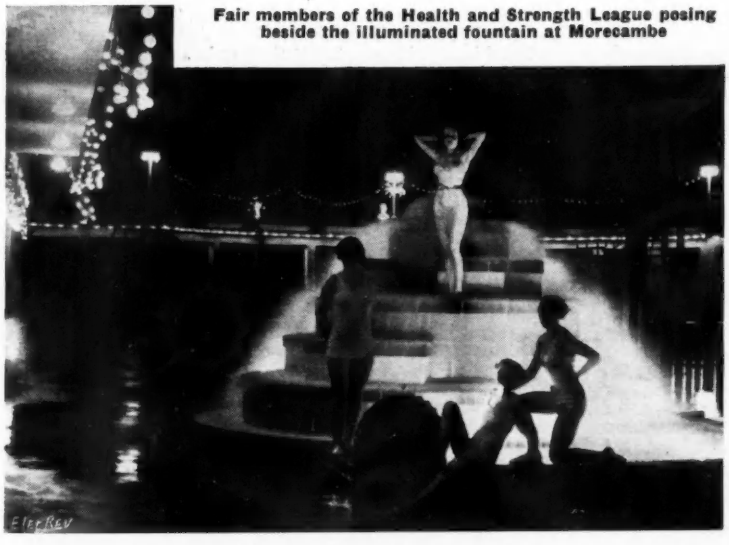
Hanwell.—SUB-STATIONS.—The Metropolitan Electric Supply Co. is to erect four sub-stations on an L.C.C. housing estate in the district.

Harrogate.—PURCHASE OF RIPON UNDERTAKING.—The borough treasurer recently submitted a report to the Electricity Committee on his examination of the accounts of the electricity undertaking of the Ripon City Council. It was resolved that application should be made to the Electricity Commissioners for their sanction to the borrowing of £57,600 in connection with the purchase and transfer of the undertaking.

India.—HYDRO-ELECTRIC WORKS IN MYSORE.—The Government of Mysore has sanctioned the installation of an additional generating unit, rated at 8,000 h.p., at Sivasandram. A separate Public Works Division has been formed at Sivasamudram in connection with the installation.

ELECTRIC POWER IN THE PROVINCES.—It is understood that various provincial Governments have undertaken to ascertain to what extent hydro-electric power is available in their territories, and what use is being made of it at present.

Fair members of the Health and Strength League posing beside the illuminated fountain at Morecambe



Inverness.—CALEDONIAN POWER SCHEME DISCUSSED.—An informal meeting in connection with the proposed revival of the Caledonian Power Scheme which was held in Inverness on August 27th, was attended by representatives of the British Oxygen Co., the promoters of the scheme, and members of the Law Committee of the Inverness County Council. The proceedings were private. No recommendation was made, but it is understood that the matter will be brought before the County Council. It will be recalled that the former Caledonian Power Scheme was rejected by the House of Commons, objection being taken chiefly to the rating provisions.

Irish Free State.—PROPOSED NEW POWER STATION AT CORK.—The Electricity Supply Board is taking steps to establish a new generating station at Cork, with a frontage to the River Lee, Cork Harbour. It is negotiating with the Harbour Board with a view to purchasing a site. The latter authority has suggested a position at Tivoli, and has asked the Electricity Supply Board to send representatives to inspect it.

CHEAPER ELECTRICITY.—Our Dublin correspondent reports that reductions in electricity charges to domestic consumers have been announced by the Electricity Supply Board. The new rates apply to consumers on the standard valuation tariffs in private residences connected to the national supply system in all parts of the Free State outside of Dublin City and environs and Cork City. They reduce by 40 to 60 per cent. the cost of all electricity used in private residences over 60 kWh in any two months (96 kWh for combined private and business premises). Electricity for cooking purposes becomes available at ¾d. per kWh, and the ½d. per kWh rate comes into operation for room heating, refrigeration, &c., after the consumption of 300 kWh has been reached.

Keith.—ELECTRIC STREET LIGHTING INAUGURATED.—The recently installed system of electric street lighting in Keith was inaugurated last Friday.

Liverpool.—WORK OF THE LIGHTING DEPARTMENT.—In an interesting report Mr. P. J. Robinson, city lighting engineer, enumerates the activities of his department during the past year. The work accomplished included the conversion of a substantial mileage from gas to electricity, extension of sodium-discharge illumination, further application of the two-unit system to secure a reduction of lighting power at midnight while maintaining uniformity of surface illumination, increased use of concrete columns and extension of remote control. In addition, there was a heavy maintenance programme, including the replacement of 37,633 pieces of glass, half at least of this work being due to wilful damage. With regard to costs, Mr. Robinson observes that the price of electricity was at the rate of 2.93d. and gas at 3.76d. per candle-power per annum, a difference of 22 per cent. Further, the operating costs of modern electric street lighting installations, including weekly cleaning and replacement of lamps are stated to be 11.8 per cent. less than with the most efficient gas street lighting installations, including the cleaning of lamps and replacement of mantles. With this economic justification, the city lighting engineer proceeded with the change-over and at March 31st last there was a reduction of 16 miles of streets, passages and courts lighted by gas while those electrically illuminated increased by 31 miles. The number of electric lamps at the end of the financial year was 15,002 as compared with 16,279 gas lamps. The electric lamps included 153 of the sodium-discharge type, which the city lighting engineer states have met with unanimous approval. With regard to standards, reinforced concrete columns and street lighting poles have been generally adopted and 406 were erected during the year, bringing the total to 2,081. The number of electric lamps now operated by the remote control system from ten points is 2,629. Further steps were taken to secure the elimination of glare and improved visibility by fitting lamps with special lanterns. In the last quarter of the year the cost of electricity was reduced from 2¾d./1d. to 2¼d./0.7d. per kWh. The consumption for the year was 6,191,290 kWh as compared with 5,535,632 kWh in the previous year. In a concluding section the city lighting engineer draws attention to statistics showing the economical administration of the department. From these it is seen that while the mileage of streets lighted increased by 241 per cent. between 1893 and 1936, the total expenditure rose by only 194 per cent., and the average cost per mile was reduced by 13.7 per cent.

Merthyr Tydfil.—OVERHEAD LINE BAN.—The Corporation has refused a request from the Merthyr Electric Traction & Lighting Co., Ltd., for permission to erect overhead mains in three thoroughfares in the borough.

Monmouth.—RURAL EXTENSIONS.—The consent of the Rural District Council to an extension to Rockfield was obtained last week, and the Council is to ask the Monmouth Electricity Co. to consider supplying Mitchel Troy, Trellech and Raglan.

Morecambe.—ILLUMINATIONS BEGIN.—On Saturday the annual "Brighter Morecambe Season" was inaugurated by the Lord Mayor of Sheffield, five miles of promenade being decoratively illuminated.

Sheffield.—EXTENSIONS.—The Electricity Committee proposes to erect a sub-station in Spring Street at a cost of £556, and to extend mains at a cost of £3,649.

Smethwick.—LOWER CHARGES.—The Shropshire, Worcestershire & Staffs Electric Power Co. has reduced its charges as follows:—Flat rate for lighting, from 5d. to 4½d. per kWh; small power, flat rate, from 1½d. per kWh to 1½d. per kWh for the first 2,500 kWh per quarter, and 1½d. per kWh in excess of that quantity.

Stalybridge and District.—EXTENSIONS AT GENERATING STATION.—Extensions are to be carried out to the boiler house and bunkers at Hartshead generating station of the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board.

West Sussex.—ELECTRICITY SUPPLY TO COUNTY COUNCIL PREMISES.—A scheme for the installation of electricity at the County Council's Drayton depôt, has been approved. It is estimated to cost the Council £600 on the basis of the electricity authority laying all cables throughout the depôt free of charge, subject to the Council's guaranteeing to pay a minimum of £125 per annum and allowing the erection of a transformer in the depôt.

Widnes.—CHEAPER ELECTRICITY.—The Mersey Power Co. has reduced the flat rate for heating and domestic appliances from 2d. to 1d. per kWh; the all-in domestic two-part running charge is to be lowered from 1¾d. to ¾d. per kWh to owners of electric cookers, otherwise to ¾d. per kWh.

Workington.—NEW MAINS.—The Electricity Committee is to extend mains at a cost of £243 to supply houses at Calva Brow.

Traction

Birkenhead.—RAILWAY ELECTRIFICATION.—It is expected that the change-over from steam to electricity on the Birkenhead Park to West Kirby L.M.S. railway will take place about next Easter. Extensions to the various station platforms along the line are already being made.

Germany.—ELECTRIC HEATING IN TRAINS.—The Siemens-Schuckert Works Co. is supplying air heaters and heat-control apparatus for the express trains of the German State Railways. Each carriage is being equipped with two 24-kW air heaters and one 14-kW heater built up from a number of sheaths. Since the heating supplied is at 1,000 V, particular attention has been paid to the insulation, while, in view of the high electrical and mechanical stresses, the framework carrying the heating elements is of particularly sturdy construction. The elements are arranged in groups of 4 kW and 3 kW, controlled by regulators, some of which are in the compartments and respond to the temperature of the ambient air, while others are mounted beneath the carriages and respond to the outside air temperature.

France.—THE LAST PARIS TRAM.—The last tram to operate in the streets of Paris was driven on its final journey on Tuesday by the same tramdriver who took the first electric tram along the route (Gare de l'Est-Montrouge) in 1913. The transport service is now operated by buses.—*Reuter.*

Irish Free State.—COMPLETE ELECTRIC TRANSPORT SCHEME.—Our Dublin correspondent reports that a scheme to electrify the country's entire transport system has been formulated by Mr. Sean Lemass, the Minister for Industry and Commerce. This involves the conversion of the railways to the third rail system; the provision of trolley-buses for internal transport in cities and the larger towns; and the use of a combination of the Drumm battery and other battery systems for all forms of road vehicles, including private cars. The cost of this scheme has been estimated to be over £50,000,000, and this does not include the huge sums that would be required to re-adjust the labour market as a result of the transfer of thousands of workers now employed in the coal and oil industries.

Norway.—OSLO RAILWAY ELECTRIFICATION.—The Norwegian State Railways have ordered four new electric motor coaches for the Oslo-Ski suburban line, which is being electrified, learns *Reuter's Trade Service* from Oslo. The electrical machinery is being supplied by A/S Norsk Electrisk og Brown Boveri, and the mechanical part by A/S Skabo Jernbanevognfabrik. The machinery consists of four motors, each of 160 h.p., and the coaches are able to haul two coupled bogie coaches at a speed of up to 70 kilometres an hour (44 m.p.h.). The doors are opened and closed from the driver's cabin, and the coaches are electrically warmed and ventilated. In November the first electric trains will run as far as Kolbotn, and the service will be prolonged to Ski as soon as the double line now under construction is finished.

Communications

Austria.—NEW TELEPHONE CABLE.—Arrangements have recently been completed between the Austrian and Yugoslav Governments for the installation of a new telephone cable between Wildon, near Gratz, Styria, and Marburg and thence to Agram and Belgrade, Jugoslavia.

China.—MARINE RADIO TELEGRAPHY.—Following European practice, nearly all sea-going steamers of more than 1,600 tons in Chinese waters are, according to the *Far Eastern Review*, now required to install radio apparatus under regulations recently adopted by the Legislative Yuan. Vessels which are exempted include passenger steamers plying not more than twenty nautical miles from the shore and those with a route between coastal ports not exceeding 200 nautical miles; freighters of less than 1,600 tons which do not ply beyond 150 nautical miles from shore, and junks and vessels of simple structure not intended for deep-sea navigation. The Chinese Government intends to exercise strict supervision over radio installations on ships, and no wireless station may be operated until a licence, renewable every five years, has been granted by the Ministry. One of the regulations requires all wireless operators on ships to be Chinese citizens holding certificates of competence issued by the Chinese Ministry of Communications.

Germany.—TELEVISION EXPERIMENTS.—The *Verkehrsnachrichten für Post und Telegraphie* reports that the German Post and Telegraph authorities, after carrying out television experiments on the Brocken in the Hartz mountains and on the Feldberg in the Taunus, have decided to install new transmitters at both places. The Feldberg transmitter will have a range of fifty miles to the North and about 62 miles towards the Rhine plain.

United States.—WIRELESS TELEPHONY FOR NEW YORK TUGS.—Ship-to-shore wireless telephony is being installed on tugs in New York harbour, after a successful demonstration on seven boats, says *Reuter's Trade Service* from New York. The service, which has hitherto been limited to ocean liners, will enable tug skippers to get their orders while at sea, saving time and fuel in putting in to shore.

Electricity Supply in South Africa

THE thirteenth annual report of the Electricity Supply Commission of South Africa covers the year ended December 31st, 1935, with the addition of a brief review of activities up to March 31st, 1936. The energy sold by the Commission increased by 13.6 per cent. to 1,119 million kWh; of this total, bulk supplies, including sales to the Victoria Falls Co. accounted for 858 million kWh (14.38 per cent. increase) and industrial and mining for 83 million kWh (3.41 per cent. decrease due to one large consumer). Traction increased to 174 million kWh (19.04 per cent.) on account of the starting up of the electrified line between Daimana in Natal and Harrismith, O.F.S., and by increased traffic elsewhere. A large number of new lighting and domestic consumers was secured in the sparsely populated areas supplied directly by the Commission and the average consumption was 1,030 kWh per head, the total for this class being 4,300,000 kWh, which represented an advance of more than 43 per cent. on 1934.

The Commission owns five principal undertakings unconnected electrically: Natal Central, Witbank, Capetown, Durban and Sabie. Particulars of the generating stations have been given in previous years. In the Natal Central area, sales amounted to 154 million kWh. The predominating load was traction which varied from 10,000 to 45,000 kW within a few minutes. Congella generating station (68,000 kW installed) has a thermal efficiency (sent out basis) of 17.6 per cent. on a load factor of 55.3 per cent. Fouling of the condensers and oil-cooler strainers has been cured by the installation of rotary strainers between the screening plant and the c.w. pumps. The 88 kV transmission system has been extended from Pietermaritzburg to Cato Ridge on towers fabricated almost entirely from discarded rails, which also carry the trolley wire. Witbank generating station (100,000 kW installed) is operated by the Victoria Falls Co. on an 80 per cent. load factor with a plant load factor of 92.4 per cent. Four additional boilers were installed with grit extractors, which are being applied also to the existing boilers. Sales amounted to 728 million kWh. All producing collieries in the district are consumers of the Commission. Arrangements are in hand for the supply next year of d.c. to the electrified railway along the Witwatersrand and between Germiston and Pretoria.

For the Capetown undertaking a third 20,000-kW turbo-alternator was put into commission at Salt River generating station bringing its installed capacity up to 90,000 kW. Future requirements are to be met by the erection of a new station (to have an ultimate capacity of 200,000 kW) by Capetown Corporation, adjacent to its existing Dock Road station, and two 50,000-kW turbo-alternators and five boilers have been ordered, and the civil engineering work is in hand. Sales in this area amounted to 80 million kWh, about 60 per cent. of which was used for traction and 25 per cent. for power, the balance including the requirements of 166 farms.

Thermal storage plant has been introduced into the Congella station (68,000 kW installed) of the Durban undertaking. Water in cylindrical steel shells is heated with steam during off-peak periods and supplied to the boilers at times of maximum demand. The output was 150 million kWh.

The fifth station, at Sabie, has only 1,350 kW of hydro-electric plant installed. Its output (7½ million kWh) was taken by two consumers.

A supply of electricity was begun to the Rand Extensions undertaking (11,200 sq. miles) from the Witbank and Klip stations *via* the Victoria Falls Co. system. In order to meet the demand for electricity for the mines along the Witwatersrand, three generating sets with an aggregate capacity of 73,000 kW have been put into commission at the new Klip station. The initial installation of 212,000 kW is expected to be completed early next year.

During the year the loan capital of the Commission was increased by £1,310,000, making the total £12,250,000. Assets were £14,694,000 and liabilities £12,770,000. Production costs (including interest, redemption and reserves) amounted to £1,219,000 and the revenue £1,251,000. The Commission is required as far as practicable not to make either a profit or a loss.

The average cost per kWh sold was 0.261d.—a reduction of 8½ per cent. on the previous year—and the revenue 0.266d—a decrease of 7 per cent.—owing to reductions in charges and improvements in consumers' load factors.

The staff employed by the Commission numbered 778, of whom 443 were Europeans.

The Commission is also required to report upon the proposals of local authorities to establish new or extend existing undertakings. During the year it dealt with seven new schemes and sixteen extension schemes.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Atcham (SALOP).—September 22nd, R.D.C. Electrically (alternatively, oil engine) driven borehole pumping plant in duplicate. Messrs. Willcox, Raikes & Marshall, 33, Great Charles Street, Birmingham (£2 2s.).

Australia.—SYDNEY.—November 2nd. County Council. Steam generating plant at the Bunnerong station. (T.Y. 30651.)*

Barking.—September 18th. Borough Council. Electrical installation work in flats and houses to be erected in Upney Lane, Blake Avenue, Tanner Square, Red Lion Place and Ripple Road. (See this issue.)

Beckenham.—September 28th. Borough Council. Four three-phase transformers. (See this issue.)

Bedfordshire.—September 8th. C.C. Education Committee. Electric lighting and power in Harrold schools. F. W. Smart, architect, Shire Hall, Bedford.

Birmingham.—September 23rd. Electric Supply Committee. Transformers and e.h.v. switchgear. (See this issue.)

Bradford.—September 23rd. Corporation. Fire extinguishing installation at the Valley Road power station. (See this issue.)

Buxton.—September 8th. Electricity Department. L.v. cables. (August 28th.)

Cardiff.—September 12th. Electricity Department. Supply and erection of a h.v. overhead and underground transmission line at Pentyrch and l.v. distribution lines in East Aberthaw. (August 21st.)

September 14th. Lamps. (See this issue.)

September 7th. King Edward VII Welsh National Memorial Association. X-ray equipment for the Kensington Hospital, St. Brides, Pembrokeshire. F. J. Alban, secretary, Memorial Offices, Westgate Street.

Chile.—SANTIAGO.—September 25th. Ministry of National Defence. Electric portal crane. (T.Y. 30670.)*

Darlington.—September 15th. Corporation. Trolley vehicles. (August 28th.)

Dumfries.—September 18th. Electricity Department. Steel switch and transformer kiosk. (August 21st.)

Edinburgh.—September 11th. Corporation. Heating and electrical installation at nurses' and maids' home, Western General Hospital, and chilling equipment for mortuaries at High School Yards and Eastern General Hospital. City architect.

Egypt.—CAIRO.—September 28th. Mechanical and Electrical Department, Ministry of Public Works. Air-conditioning plant for the new Chemical Department building. Chief inspecting engineer, Egyptian Government, 41, Tothill Street, London, S.W.1 (deposit £1 10s. 9d., not returnable).

October 20th. Supply and erection of Naga Hamadi hydro-electric and electric pumping stations. Chief inspecting engineer (deposit £5 2s. 6d., not returnable.)

Farnworth.—September 7th. Electricity Department. Wiring cables and cooker control units. (August 21st.)

Folkestone.—September 14th. Corporation. Internal and external wiring of 453 houses and flats on the Canterbury Road housing estate. (August 7th.)

Hastings.—September 10th. Borough Council. Coal for Broomgrove power station. (See this issue.)

India.—SIMLA.—September 11th. Bombay, Baroda and Central India Railway Co. Plates and separators for train lighting accumulators. (August 28th.)

October 27th. Stores Department (Electrical Branch). House service d.c. and a.c. meters. (T. 30724.)*

NEW DELHI.—September 29th. Stores Department. Rotary convertors, transformers and switchgear. (T.Y. 30704.)*

Kirkcaldy.—September 14th. Corporation. Electrical work at the Loanhead housing estate. Borough surveyor.

Lanark.—September 7th. County Council. Heating and electrical installations in connection with new secondary school, Airdrie. J. Stewart, County architect, 32-36, Albert Street, Motherwell.

Leeds.—September 9th. Baths and Property Committee. Rewiring and alterations to electrical installations at York Road baths. J. E. Acfield, city engineer, Civic Hall.

Linlithgow.—Town Council. Electrical work at housing estate. W. M. Scott, architect.

London.—METROPOLITAN WATER BOARD.—October 5th. Four high-compression heavy fuel oil engines with centrifugal pumps and electrical generators, three electrically driven borehole pumps, switchboard and appurtenant works at the Crayford pumping station. Chief engineer, Offices of the Board, Room 235, 173, Rosebery Avenue, W.C.1 (deposit £2 2s. with the Comptroller to the Board).

HACKNEY.—September 7th. Borough Council. Electrical installation at a block of flats. (August 28th.)

September 23rd. Electrical installation at a block of flats. (August 28th.)

OFFICE OF WORKS.—September 10th. Wiring for power and lighting at M/L Redbridge, Southampton. (August 28th.)

Luton.—September 19th. Wiring and installation of electric lighting and fittings in 184 houses. J. W. Tomlinson, borough engineer, 12, Upper George Street.

Manchester.—September 21st. Electricity Committee. Motor driven boiler feed pump, flue gas ducts, dismantling existing gas ducts and modifications to pipework, h.p. steam and feed water pipework and l.p. circulating water pipework, and one 2,000-kVA transformer for the Barton power station, and one 10,000-kVA transformer for the Dickinson Street station. (See this issue.)

Middleton (LANCS).—September 12th. Borough Council. Static transformers. Borough electrical engineer, Corporation Street.

New Zealand.—WELLINGTON.—October 27th. Public Works Department. 33-kV/11-kV transformer bank. (T.Y. 30574.)*

October 20th. Electric motor-driven centrifugal pump. (T.Y. 30688.)*

November 3rd. Motor operated weir penstock gate and equipment for water rheostat. (T.Y. 30576.)* 22,200-kVA generator and turbine. (T.Y. 30573.)*

October 13th. Two metal-clad oil circuit-breakers. (T.Y. 30698.)*

October 27th. Three 66-kV potential transformers. (T.Y. 30690.)* Four 66-kV oil-immersed circuit-breakers. (T.Y. 30697.)* Two 5-ton and one 2-ton electric cranes. (T.Y. 30695.)*

AUCKLAND.—October 6th. Public Works Department. Two outdoor-type, 110,000-V, 400-A, 3-phase oil-immersed circuit-breakers. (T.30696.)*

Northern Ireland.—BELFAST.—September 7th. Harbour Commissioners. 15-ton electrically operated travelling gantry crane (3-phase, 380-V, 50-cycles), for the Thompson graving dock. T. N. Burke, superintendent of cranes, Harbour Office.

Radcliffe-on-Trent.—September 9th. Committee of Visitors. Electrically driven equipment, including vacuum pump, mixer, potato peeler, potato-chipping machine, and slicing machine, for Notts County Mental Hospital. Clerk of the Hospital.

Sheffield.—September 7th. Electricity Department. Five 600-kVA, 3-phase, 11,400/400-V outdoor type transformers. (August 28th.)

Sleaford.—September 21st. U.D.C. Electricity Department. L.v. underground distribution mains and material and service cut-outs, joint boxes, insulating tape, meter boards and joint box compound. (See this issue.)

South Africa.—JOHANNESBURG.—Railways and Harbours Administration. September 28th. Two electric battery tractors. (T.Y. 30605.)*

PRETORIA.—September 11th. Union Tender and Supplies Board. Automatic time check apparatus, master clock, relays, oscillator and time checks. (T.Y. 30625.)*

CAPE TOWN.—September 16th. Electricity Department. Nine 1,000-kVA, twelve 500-kVA, and twelve 300-kVA, 3-phase transformers. (T.Y. 30654.)*

Stoke-on-Trent.—September 9th. Electrical Engineer's Department. Domestic electric cookers, wash-boilers and kettles. (August 28th.)

Teddington.—September 10th. U.D.C. Traffic signals in Broad Street. E. Bostock, surveyor, Council Offices (deposit £2).

Walsall.—September 15th. Walsall and West Bromwich (Barr Colony) Joint Board. Engineer's and electrical fittings for six months commencing October 1st next. Clerk and steward, Great Barr Park Colony.

Warrington.—September 7th. Electricity Department. (a) Extra-high-voltage and low-voltage and lead-covered and other cables; (b) earthenware conduits; and (c) reinforced concrete cable protector slabs and tiles. (August 21st.)

Warwick.—September 14th. Warwick Joint Hospital Board. Electrical installation in the extension to Heathcote Isolation Hospital and new laundry. Clerk of the Joint Board.

West Midlands.—September 22nd. Joint Electricity Authority. (*a*) 33-kV transmission switchgear and step-down transformers; and (*b*) 11-kV distribution switchgear. (August 28th.)

West Riding.—September 5th. County Council. Electric lighting, &c., at the Listerdale Maternity Home, Wickersley. West Riding architect, County Hall, Wakefield.

Worthing.—September 11th. Electricity Department. (*a*) Supervisory control equipment, e.h.v. switchgear and transformers; and (*b*) kiosk sub-stations and transformers. (August 28th.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Bournemouth.—Education Committee. Accepted. Electric lighting installations at Alma Road school (£221).—G. Shears & Sons.

Coulsdon.—Highways Committee. Accepted. Illuminated traffic bollards.—Revo Electric Co.

Glasgow.—Corporation. Accepted. Electrical work at 790 houses to be erected at Berryknowes Road.—A. & C. Edelman, Ltd.

London.—L.C.C.—Wiring and fittings for electric lighting, &c., in blocks 1, 2, 5, 7 and 8 of dwellings in the Victoria Street area, Islington :—

	£		£
Jacob White & Co. Accepted ...	2,108	Grant & Blake, Ltd.	2,704
A. Meckhonik	2,217	Springvale Electrical Co. ...	2 778
Read & Partners, Ltd.	2,303	H. Estall	3,220
A. E. Mayhew & Co.	2,365		

Accepted. Wiring and fittings for electric lighting, &c., at the Southern Outfall Works (£695).—Barlow Bros. & Co. This was the lowest of six tenders, the highest being £911. Wiring

and fittings for electric lighting, &c., in blocks 1 and 2 of dwellings on the Millwall estate (Phœnix Wharf site), Poplar (£1,467).—S. Reed & Sons. (Lowest of eight tenders, highest being £1,942). Wiring and fittings for electric lighting in blocks 2 and 7 of dwellings on the Friary estate (Levant Street area), Camberwell (£793).—W. H. Gaze & Sons. (Lowest of six tenders, highest being £907.) Wiring and fittings for electrical installations at schools: Avenue (late John Ruskin Senior Boys'), Southwark (£946).—Pinching & Walton. (Lowest of six tenders, highest being £1,169.) Effra Parade, Norwood (£1,080).—Higgs & Hill, Ltd. (Lowest of ten tenders, highest being £1,656.) Elizabeth Street, Woolwich (£874).—Pemberton & Sturgess (Great Britain). (Lowest of eleven tenders, highest being £1,394.) Wiring and fittings for electric lighting at the Mile Oak approved school, Portslade, Sussex (£861).—E. & C. Champion. (Lowest of six tenders, highest being £1,425.)

Wiring and fittings for electrical installations at Addison Gardens school, Hammersmith, S.:—

	£		£
H. Estall. Accepted	**1,019**	Read & Partners, Ltd.	1,626
A. Cozens	1,420	Electrical Installations, Ltd. ...	1,820
Houchin, Ltd.	1,546	C. J. Ferguson & Sons	2,202

Electrical work at extension (second section) of the Ewell Mental Hospital:—

	£		£
W. J. Furse & Co. Accepted ...	**3,076**	A. Hawkins & Sons	3,659
Read & Partners, Ltd.	3,089	G. E. Taylor & Co.	3,662
H. J. Cash & Co.	3,206	Berkeley Electrical Engineering Co.	3,681
Buchanan & Curwen, Ltd. ...	3,310		
Ellis & Ward, Ltd.	3,315	Pinching & Walton	3,718
T. Clarke & Co.	3,320	Malcolm & Allan (London), Ltd.	3,918
Electrical Installations, Ltd. ...	3,325	J. Hunter & Co.	3,925
S. Reed & Sons	3,381	Collins Electrical, Ltd.	3,961
B. French, Ltd.	3,536		

Electric passenger lift at Princess Mary's Hospital for Children, Margate:—

	£		£
Bennie Lifts, Ltd. Accepted ...	**600**	Waygood-Otis, Ltd.	770
Etchells, Congdon & Muir, Ltd....	629	Evans Lifts, Ltd.	815
W. Wadsworth & Sons	654	J. & E. Hall, Ltd.	850
Pickerings, Ltd.	740	Marryat & Scott, Ltd.	937

Electric bed lift at St. Andrew's Hospital, Bow:—

	£		£
Pickerings, Ltd. Accepted ...	**862**	J. & E. Hall, Ltd.	984
Marryat & Scott, Ltd.	977	Waygood-Otis, Ltd.	1,042

Wiring and fittings for electric lighting, power, &c., in block A, convalescent block, &c., at the Princess Mary's Hospital, Margate:—

	£		£
Berkeley Electrical Engineering Co. Accepted	**3,742**	Electrical Installations, Ltd. ...	4,301
		H. J. Cash & Co.	4,601
W. J. Furse & Co. (London) ...	3,842	B. French, Ltd.	4,755
Blackburn, Starling & Co. ...	3,860	Pinching & Walton	4,889
A. Cozens	3,900	Buchanan & Curwen, Ltd. ...	5,065
J. E. Swann & Co.	3,975	Malcolm & Allan (London), Ltd.	5,112
A. Hawkins & Sons	3,995	T. Clarke & Co.	5,300
Read & Partners, Ltd.	4,139		

Manchester.—Electricity Committee. Accepted. Transformers.—Hackbridge Electric Construction Co. Cables.—B.I. Cables; Connolly's (Blackley); W. T. Glover & Co.

Oldham.—The tender of the Alpha Manufacturing and Electrical Co., Ltd., London, has been accepted for the complete electrical installation at the Grand Theatre for Mr. L. Morris, of Shaftesbury Avenue, London. The architects are J. Owen Bond & Son, Norwich.

Sheffield.—Electricity Committee. Accepted. Auxiliary switchgear for the Neepsend power station (£1,872).—Switchgear & Cowans, Ltd.

South Africa.—CAPE TOWN.—Electricity Committee. Accepted. For Table Bay power station: Secondary operating battery (£849).—Chloride Electrical Storage Co. Rectifier equipment for battery charging and lighting load (£568).—Hewittic Electric Co. Telephone and staff calling equipment (£235).—Clifford & Snell (Eng.), Ltd. Fire-fighting equipment for switch house (£2,180).—Walter Kidde & Co. Oil filtering and associated equipment (£1,445).—Streamline Filters, Ltd. Current limiting reactors (£7,958).—A.S.E.A. Electric, Ltd.

Thurso.—Town Council. Accepted. Electrical work at thirty-six houses.—R. Finlayson & Co., Wick.

Notes

London Electricity Supply Companies Reunion

A reunion of members of the staffs, both engineering and commercial, of the St. James' & Pall Mall Electric Light Co., Ltd., and the Central Electric Supply Co., Ltd., from 1891 onwards is contemplated for November 7th. All such members are requested to communicate with Mr. R. H. Mace, 19, Carnaby Street, Golden Square, W.1, giving particulars of period of service and present address.

Fatalities

At Carlisle last week an inquest was held into the death of Mrs. Ada McTeare who was found dead in her home. It was stated in evidence that Mrs. McTeare had removed an electric lamp attached to a length of flex from her scullery to the washhouse, the floor of which was covered in water. The lamp proved defective and in consequence Mrs. McTeare sustained a fatal shock. A verdict of "Accidental death by electrocution" was recorded.

The daily Press reported last week that Alfonso Marcantonio, of South Lambeth, was carrying a can of milk from his shop to a yard when he tripped over the leads of an electric fan. The milk was upset and the fan fell upon him, causing him to receive a fatal shock. His wife, who went to his assistance, also sustained a severe shock.

The *Yorkshire Observer* reports that Arthur Clee, an electrician employed at the works of Messrs. Woodhouse & Mitchell, Ltd., Brighouse, was working on an overhead crane on August 28th when a flash occurred and Clee received extensive head injuries which proved to be fatal.

Educational

A scholarship, value £40 per annum, tenable at the Northampton Polytechnic, London, E.C., is offered by the Worshipful Company of Clockmakers. Enrolment commences on September 14th for full-time and part-time courses in electrical and all branches of engineering at the Polytechnic.

(See our classified advertisements.)

Appointments Vacant

Switchboard attendant at the Stafford electricity works for the N.W. Midlands J.E.A.

Junior chemist for the Fulham Borough Council.

Electrical engineering assistants in the drawing office for the Air Ministry.

Meter repairer and tester for East Grinstead Electricity Department.

Junior mains assistant for the Gloucester Electricity Department.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

SPIC-SPAN vacuum cleaner.
DICAL ceiling fittings.
BESTRON lamps.
BADCOTT electrical carbonators (American).
BALDWIN-FRANCIS starting gear.
DEE-BEE gasfilled lamps.
VACDUS carpet sweeper.

Readers should enclose stamped addressed envelopes when making their inquiries.

Mr. Vincent de Ferranti, who is attending the World Power Conference, being seen off at Waterloo last Wednesday by members of his staff and friends

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. R. F. Browne, chairman of the I.F.S. Electricity Supply Board, and **Dr. T. A. McLaughlin,** who have been nominated by the Irish Free State Government to attend the World Power Conference at Washington from September 7th to 12th, have left Dublin for America. **Mr. H. J. Allcock,** M.Sc., of Callender's Cable & Construction Co., Ltd., who is also attending the World Power Conference, is *en route* to New York on the *Queen Mary*.

Mr. A. F. Harrison is retiring from the position of managing director of the City of London Electric Lighting Co., Ltd., on September 30th, and **Mr. H. J. Randall,** F.C.I.S., formerly secretary of the company, has been appointed manager and secretary from July 1st, 1936. Mr. Harrison has been associated with the company since 1892. He was appointed assistant secretary in 1902, secretary in 1906, and general manager and secretary in 1931. He became managing director in 1933.

[*Elliott & Fry*
Mr. A. F. Harrison

Mr. E. Golightly, who has been appointed District Docks Machinery Engineer, Grimsby and Immingham, L.N.E.R., served his apprenticeship in mechanical and electrical engineering with Cowans Sheldon & Co., Ltd., joining the former N.E.R. in 1914 as engineer-in-charge, King George Dock, Hull. He was appointed assistant to the mechanical engineer, Hull Docks, in 1930, which position he held until August 10th last, when he took up his new duties.

Mr. M. A. T. Johnson has been elected chairman of Messrs. Richard Johnson & Nephew, Ltd., in succession to the late Lt.-Gen. Sir Walter Campbell.

Mr. N. Hunter, deputy electrical engineer to the Whitehaven Corporation, has been appointed borough electical engineer of Morley, Yorks. Mr. Hunter, who is thirty-six, succeeds Mr. J. E. Ellis, who retires in November. There were eighty-five applicants for the position. The salary is £450 (rising to £500) per annum.

Mr. S. F. Bickell, has been appointed works manager to the British National Electrics, Ltd. Mr. Bickell received his education at Faraday House, and spent six years with the Brompton and Kensington Accessories Co., designing and manufacturing domestic and industrial heating and cooking appliances. He joined the Revo Electric Co., in the capacity of designer and manager of that company's heating and cooking department where he remained for seven years, after which he was for three and a half years with Messrs. Falk, Stadelmann and Co., in a similar capacity, vacating this position to take up his present appointment with the British National Electrics, Ltd. Mr. Bickell is a member of the I.E.E., and has a number of patents to his credit relating to heating and cooking apparatus.

[*Lafayette*
Mr. S. F. Bickell

Mr. C. H. Pearman and **Miss J. M. V. Fright** of the London Associated Electricity Undertakings, Ltd., were married on August 29th. Miss Fright, who is the daughter of Mr. P. W. V. Fright of the Jackson Electric Stove Co., was the winner of the 1934-5 National Public Speaking Competition, organised by E.D.A. Mr. Pearman is the youngest son of Mr. W. A. Pearman, general manager of the London Power Co.

Mr. A. J. Till, A.M.I.E.E., was married on August 22nd to Miss M. A. Wilson.

Mr. S. Dawson, of the Sheffield Corporation Transport Department, has been appointed assistant tramways rolling stock and overhead equipment superintendent with the Leicester Corporation.

Lord Hirst and **Lord Gainford** have consented to become patrons of the Institute of Wireless Technology.

Delegates to the World Power Conference leaving Waterloo. **(See page 302)**

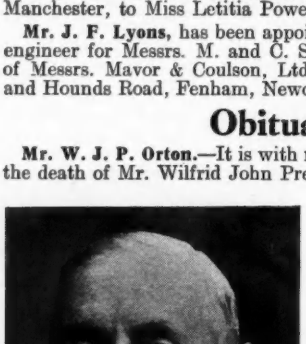
1. Mr. H. C. Lamb (Manchester). 2. Mr. and Mrs. H. L. Buckman and Mr. and Mrs. J. H. Parker (London Transport Board). 3. Dr. F. S. Sinnatt (Director of Fuel Research). 4. Mr. H. A. Hobson and Sir Archibald Page (Central Electricity Board). 5. Miss C. Haslett (E.A.W.).

Mr. C. Cameron Kirby, A.M.Inst.C.E., A.M.I.E.E., engineer and manager to the Alderley Edge and Wilmslow Electricity Board, was married on August 27th at St. Annes Church, Manchester, to Miss Letitia Powell, B.A.

Mr. J. F. Lyons, has been appointed North of England sales engineer for Messrs. M. and C. Switchgear, Ltd., (subsidiary of Messrs. Mavor & Coulson, Ltd.). His address is 25, Fox and Hounds Road, Fenham, Newcastle-on-Tyne.

Obituary

Mr. W. J. P. Orton.—It is with regret that we have to record the death of Mr. Wilfrid John Previté Orton, of Messrs. Johnson & Phillips, Ltd., which occurred at a nursing home in Bournemouth on August 18th. Mr. Orton was born at Brassington Vicarage, Derbyshire, in 1873, and was educated at Kibworth and Wyggeston Grammar Schools, Leicester, later becoming a student at the Faraday House Training and Testing Institution, London. In 1895 he joined Messrs. Ferranti, Ltd., and remained with them until January, 1903, when he went to the British Westinghouse Co., Ltd., now the Metropolitan Vickers Electrical Co., Ltd., as switchgear engineer. In 1914 he was appointed to the management of the Switchgear and Transformer Departments of Messrs. Johnson & Phillips, Ltd., relinquishing control of the latter in 1920 in order to devote the whole of his activities to the Switchgear Department, which had grown rapidly. From May, 1933, Mr. Orton represented the company on a number of Technical Committees of the B.E.A.M.A., and he also represented B.E.A.M.A. on several B.S.I. Committees and on the Wiring Regulations Committee of the I.E.E. He leaves a widow and three daughters.



The late Mr. W. J. P. Orton

Mr. F. A. Darrah.—We regret to learn of the death of Mr. Frank A. Darrah, managing director of Messrs. Baxendale & Co., Ltd., which occurred on August 27th at his home in Birkdale. Mr. Darrah, who had been managing director of the company from its inception and was previously a partner in the firm, gave the whole of his working life of forty-seven years to the furtherance of the business.

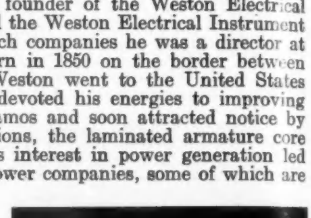
Mr. W. Fraser.—A *Reuter* message states that Mr. William Fraser, general manager of the Mexican Light & Power Co., was shot in his office in Mexico City on August 25th by a former employé of the company, and died on the following day. Mr. Fraser was a Scotsman.

Sig. Ing. U. Bono.—The death recently occurred at Brescia, Italy, of Signor Ing. Umberto Bono, one of the leading Italian authorities on the construction of hydro-electric power stations.

Mrs. L. Robinson.—We regret to learn of the death of Mrs. L. Robinson, wife of Mr. Lionel Robinson, of Lionel Robinson & Co., which occurred on August 15th from heart failure while bathing.

Mr. J. Jackson, who has died at the age of seventy-five, was the founder of Messrs. J. & H. B. Jackson, Ltd., metal merchants, Coventry, Electrical Appliances, Ltd., Electro-Mechanical Supplies, Ltd., and the Coventry Refining Co.

Dr. E. Weston.—We regret to announce the death on August 20th of Dr. Edward Weston, one of the pioneers of the electrical industry and founder of the Weston Electrical Instrument Corporation and the Weston Electrical Instrument Co., Ltd., Surbiton, of which companies he was a director at the time of his death. Born in 1850 on the border between England and Wales, Dr. Weston went to the United States at the age of fifteen. He devoted his energies to improving the then existing d.c. dynamos and soon attracted notice by two fundamental contributions, the laminated armature core and the field rheostat. His interest in power generation led him to start a number of power companies, some of which are still in operation. In 1888 he produced the first direct-reading electrical indicating instrument ever made. This was the Weston Model I which, even now, is still a recognised "standard." Among his many other inventions were the external shunt, the production of "Constantan" and "Manganin," and the officially accepted international standard of e.m.f. (the Weston standard cell, using cadmium and mercury electrodes). Dr. Weston was the first commercial user of bakelite. Later developments for which he was responsible included improvements in the moving-iron type of instrument, the development of the direct-reading electrodynamometer, the compensated thermo-couple instrument for high frequency a.c. measurements, the rectifier bridge for a.c. measurements, and the first commercially practical dry disc photo-electric cell. He was a past-president of the American Institute of Electrical Engineers and received many diplomas and awards, the most recent of which was the Lamme Medal presented to him in 1933 "for his achievements in the development of electrical apparatus, especially in connection with precision measuring instruments." Dr. Weston is survived by his son, Mr. E. F. Weston, president of the Weston Electrical Instrument Corporation.



The late Dr. E. Weston

Mr. J. N. Southern.—The death occurred suddenly at his home at Bramhall, near Stockport, on August 27th, of Mr. J. N. Southern, who for over twenty-four years was the representative in the Manchester district of the D. P. Battery Co., Ltd.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Thomas Winston, Ltd.—Private company. Registered August 26th. Capital, £10,000. Objects: To acquire the business of a manufacturer of aluminium hollow-ware and electrical appliances, &c., carried on by T. Winston at King's Norton; also to carry on the business of manufacturers of and dealers in household appliances, lighting and heating apparatus, hairdressing sundries, &c. The directors are: T. Winston, Birmingham Factory Centre, King's Norton, Birmingham, and Bank Hey Street Stores, Ltd., 60 and 62, Bank Hey Street, Blackpool. Registered office: Birmingham Factory Centre, King's Norton, Birmingham.

I. N. I. Trust, Ltd.—Private company. Registered August 27th. Capital, £5,000. Objects: To adopt an agreement with G. Bossini and to develop and turn to account the patent rights and assets comprised therein, and to carry on business as refrigerating, heating, lighting, gas, electrical, wireless, television, cinematograph and mechanical engineers and contractors, manufacturers of and dealers in and letters on hire or hire purchase of apparatus, &c. The first and permanent directors are: G. Bossini, 24, Gloucester Terrace, London; G. M. Hubbard, Robinswood, Pickhurst Rise, W. Wickham, Kent; R. P. Lombardini, 69, Pretoria Road, S.W.16; and F. L. Green, 41, Chichele Road, Cricklewood. Secretary: G. J. H. Horne, Highdown, Benfield Crescent, West Hove. Solicitors: Walter, Burgis & Co., 1, 4 and 5, Bond Court, Walbrook, E.C.4.

Foote Milne & Co., Ltd.—Private company. Registered August 29th. Capital, £1,000. Objects: To carry on the business of electrical engineers, &c. The directors are: A. D. Sleeman Rice, 1, Kirkstall Road, S.W.2, and W. E. Rice, 217, Ashley Gardens, S.W. Registered office: 15, Stockwell Road, S.W.9.

Banham's (Engineering), Ltd.—Private company. Registered August 24th. Capital, £3,000 in 2,500 8 per cent. cumulative preference shares of £1 each, and 10,000 ordinary shares of 1s. Objects: To carry on the business of mechanical, electrical, research and experimental engineers, &c. The permanent directors are: W. F. Banham, 474, Uxbridge Road, Shepherd's Bush, W.12, P. G. Fisher, 102, Crickdale Avenue, S.W.2, L. P. Coombes, 42, Arnos Villas, Bowes Road, N.11, and R. Harrison-Newby, 66, Priory Road, Hornsey, N.8. Secretary: R. Harrison-Newby. Registered office: 39-41, New Oxford Street, W.C.1.

A. C. Baker, Ltd.—Private company. Registered August 25th. Capital, £1,000. Objects: To acquire the business of electrical engineers and contractors carried on by A. C. Baker, E. C. Fletcher and F. W. Dew, at Northfield Avenue, Ealing. The permanent directors are: A. C. Baker, 142, Northfield Avenue, W.13 (managing director), E. C. Fletcher, 167, St. Albans Avenue, W.4, and F. W. Dew, 20, Park Avenue, Hounslow. Registered office: 142, Northfield Avenue, West Ealing, W.13.

F. W. Thorpe, Ltd.—Private company. Registered August 26th. Capital, £5,000. Objects: To carry on the business of manufacturers of and dealers in electric lamps and illuminating and heating apparatus of every description, &c. The directors are: F. W. Thorpe, and Mrs. L. E. Thorpe, both of 20, Whitefields Road, Solihull, Birmingham. Registered office: 39, Bolton Road, Small Heath, Birmingham.

Anglo South American Development Co., Ltd.—Public company. Registered August 24th. Nominal capital, £1,000. Objects: To negotiate for, obtain, exercise and carry out options, concessions or contracts for public works, electric power stations, electrical installations or otherwise, and to carry on the business of bankers, capitalists, financiers, and merchants, to act as agents, factors and merchants for any Argentine products or for goods to be disposed of therein, &c. An agreement is proposed between Compania Argentina Comercial y Financiera Sociedad de Responsabilidad Limitada (vendors) and this company, for the acquisition of certain contracts, &c. The subscribers are: A. I. Slater, 10, Lancaster Gate, W.2, and six others. Solicitors: Woodhouse & Co., Aldwych House, W.C.2.

Howitt (Wholesale), Ltd.—Private company. Registered August 24th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless, television and telephonic receiving and transmitting apparatus and component parts, &c. The subscribers are: W. H. Howitt, 134, Meols Parade, Meols, Wirral, and A. W. Robinson, 43, Halsbury Road, Liverpool, 6. Secretary: A. W. Robinson. Registered office: Lomax Buildings, 34, Cumberland Street, Liverpool.

C. J. Hobbs & Sons, Ltd.—Private company. Registered August 24th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electricians, general electrical engineers, &c. The permanent directors are: C. J. Hobbs, 34, Queen's Road, Portsmouth, F. C. J. Hobbs, "Rhondorf," Copnor Road, Portsmouth, and C. F. R. Hobbs, 84, Amberley Road, Portsmouth. Secretary: Fredk. C. J. Hobbs.

C. F. Turner, Ltd.—Private company. Registered August 28th. Capital, £500. Objects: To acquire the business of an electrical and wireless engineer carried on by C. F. Turner at 163, Wickham Road, Shirley, Croydon. The directors are: C. F. Turner and Mrs. I. M. Turner, both of 43, Ridgmount Avenue, Shirley, Croydon. Registered office: 163, Wickham Road, Shirley Road, Croydon, Surrey.

Returns of Electrical Companies

County of London Electric Supply Co., Ltd.—Capital, £14,000,000 in £1 shares (3,500,000 6 per cent. cumulative preference, 3,000,000 4 per cent. cumulative preference and 7,500,000 ordinary). Return dated April 7th, 1936. 3,381,925 6 per cent. cumulative preference, 2,000,000 4 per cent. cumulative preference and 5,707,109 ordinary shares issued (all converted into stock). £8,504,441 paid. £2,584,593 considered as paid. Mortgages and charges £5,500,000.

British Vacuum Cleaner and Engineering Co., Ltd.—Satisfaction on August 21st, 1936, of charge dated July 11th, 1922, and registered July 25th, 1922. (According to the register of mortgages the charge registered January 25th, 1922, originally secured all moneys due to bank.)

E. Hammond & Co. (Auto-Electric), Ltd.—Capital, £1,600 in 400 cumulative preference and 1,200 ordinary shares of £1 each. Return dated January 3rd (filed May 25th), 1936. 302 preference and 1,200 ordinary shares taken up. £702 paid on 302 preference and 400 ordinary. £800 considered as paid on 800 ordinary. Mortgages and charges, nil.

Macintosh Cable Co., Ltd.—Capital, £250,000 in £1 shares. Return dated April 8th, 1936. 200,000 shares taken up. £13,004 paid. £186,996 considered as paid. Mortgages and charges, nil.

Chasetown and District Electricity Co., Ltd.—Capital, £100,000 in £1 shares. Return dated April 8th, 1936. 63,130 shares taken up. £1,000 paid. £62,130 considered as paid. Mortgages and charges, nil.

Metropolitan-Vickers Electrical Co., Ltd.—Capital, £250,000 in £1 shares. Return dated March 25th, 1936. 10,002 shares taken up. £10,002 paid. Mortgages and charges nil.

Symondsbury Electric Lighting Co., Ltd.—Capital, £2,000 in £5 shares. Return dated April 18th, 1936. 248 shares taken up. £1,240 paid. Mortgages and charges, nil.

Pritchett & Gold and E.P.S. Co., Ltd.—Capital, £200,000 in £1 shares (100,000 preference and 100,000 ordinary). Return dated April 2nd, 1936. All shares taken up. £30,394 paid on 15,233 preference and 15,161 ordinary. £169,606 considered as paid on remainder. Mortgages and charges, nil.

West London and Provincial Electric and General Trust, Ltd.—Capital, £390,000 in £198,000 ordinary stock and £192,000 preference stock. Return dated May 14th, 1936. All stock taken up. £264,000 paid. £126,000 considered as paid. Mortgages and charges, £200,000.

Morecambe Electrical Equipment Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated August 17th, 1936, to secure £7,500. Holder: J. W. Ward, Ardenlea, Mount Avenue, Bare, Morecambe and Heysham.

City Notes

Veritys, Ltd.—The *Financial Times* reports that a reconstruction scheme is proposed by Veritys, Ltd. The accounts at December 31st last show a debit balance of £198,837, which is to be reduced by £192,500 by cutting the capital from £196,000 to £3,500. This cut will be effected by reducing the 7,000 5 per cent. first preference shares of £10 to 10s. each, and by cancelling the 7,000 6 per cent. second preference shares of £10 each, the 7,000 8 per cent. preferred ordinary shares of £7 10s. each and 70,000 deferred shares of 1s. each. Preference share dividends are in arrear since January 1st, 1929. Each of the 10s. first preference shares resulting from the cut is to be sub-divided into two of 5s. each and will become ordinary shares. Dividend arrears on these sub-divided shares will be cancelled. The capital will then be increased to £196,000 by the creation of 770,000 5s. ordinary shares. Of the new ordinary shares 525,000 are to be offered to shareholders at 5s. 6d. each in the proportion of forty for each first preference held on August 31st, twenty for each second preference, ten for each preferred, and five for every ten deferred shares. Achilles Trust holds, or is beneficially entitled to, £32,590 6 per cent. debenture stock, 596 6½ per cent. second debentures of £100 each, 584 first preference shares, 1,021 second preference shares, 17 preferred shares and 60,000 deferred shares, and has offered to acquire from other shareholders their shares on the following terms: For first preference, 21s. 6d. each; for second preference, 5s. each; for preferred shares, 2s. 6d. each; and for deferred shares, 1½d. each. Mr. B. C. Evans and Mr. C. J. E. Pitt, joint managing directors of the company, are to be offered 21,000 5s. ordinary shares at 5s. 6d. in consideration of their agreeing to the cancellation of their existing appointments and their entering into fresh contracts. Any shares not taken up by shareholders will be subscribed by Achilles Trust at 5s. 6d. The Trust will receive a commission of 3d. per share in respect of the offer of all the 525,000 shares, and will have the right within two years of the capital reduction taking effect to subscribe at par for any of the remaining 224,000 new ordinary shares of 5s. each. The £50,054 of 6 per cent. mortgage debenture stock is to be repaid at 105 per cent., and the £70,000 of 6½ per cent. debentures at par. Meetings to consider the scheme will be held on September 15th.

The Palestine Electric Corporation reports a net profit for 1935 of £P218,914, as compared with £P165,511 in the preceding year. It is proposed to place £P40,000 to income-tax reserve and £P50,000 to general reserve. The final dividend on the ordinary and "A" ordinary shares is 5 per cent., making 7½ per cent. for the year, and £P26,3552 is carried forward. In January last an issue of 200,000 "A" ordinary shares of £1 each was made to holders of ordinary and "A" ordinary shares at 45s. each. Reductions in the rates for electricity were introduced during the year. The number of consumers increased from 35,397 to 53,246. The new power station at Haifa was completed during the year and commenced to supply electricity in May, 1935. To meet the growth of the demand for electricity, however, the installation of an additional 12,000 kW turbo-generator is now being completed, making the total present capacity of the Haifa power house 30,000 kW. Further extension of this station is now in progress.

The Utilities Power & Light Corporation.—A *Reuter* message from New York states that a suit to stay the sale of the British holdings of the Utilities Power and Light Corporation has been filed in the Richmond (Virginia) District Court against the Corporation by four small stockholders. The latter allege that the value of the holdings sold is far in excess of the sale price of $25,000,000, and contend that the stockholders did not vote on the sale, and that no authority was given to carry on negotiations. It is stated that this action will not affect the sale. The British subsidiary of the Corporation, Greater London and Counties Trust, Ltd., is now in liquidation, as reported on page 318 of this issue.

Lancashire Dynamo & Crypto, Ltd., has declared an interim dividend of 5 per cent. actual, less tax, on the ordinary shares. Last year a dividend of 10 per cent., less tax, was paid for the twelve months on the ordinary shares. At an extraordinary meeting held in Manchester on August 26th, the proposal to increase the capital to £380,000 by the creation of 60,000 ordinary shares of £1 each was approved.

Ward & Goldstone, Ltd., are paying the usual interim dividend for the half-year on the cumulative preference shares at the rate of 7 per cent. per annum.

Brown Bros., Ltd., are maintaining the interim ordinary dividend at 2½ per cent.

Pinchin, Johnson & Co. have announced an interim dividend of 7½ per cent. on the ordinary shares (same).

Stocks and Shares

TUESDAY EVENING.

IF September provides the Stock Exchange markets with as much activity as August did, members of the House and their clients are scarcely likely to complain of the apathy with which markets are generally charged at this season of the year. As these columns witnessed during August, the disposition of prices continued steadily good, with certain dramatic movements occurring in the industrial list, and with public attention actively engaged in Stock Exchange markets. So far from there being any recession in the prices of gilt-edged stocks, the current tendency is for prices to go still better. Such gilt-edged securities cannot be expected to show further material improvement, but the prophets are confounded who have been preaching the doctrine that expansion in trade would automatically cause reaction in the quotations for money stocks. This week there is no outstanding feature in the fixed-interest issues. Electricity supply shares, now justifiably regarded as gilt-edged in their own particular class, are holding on to their recent strength. The deduction of dividends last month served to attract prospective purchasers, in the hope that ex dividend markings would bring shares to market from people who had postponed realisation of the shares until the dividends had been deducted from the prices. In point of fact, this expectation failed to fructify; in most cases, the deductions were recovered almost at once.

Electricity Supply Shares

Clyde Valley shares have again been in request from the North, and at 46s. show a small improvement, following upon the rise of last week. Midland Counties, at 41s., are 6d. up.

The rest of the shares quoted in our table exhibit little alteration. Whitehall preference are better at 22s., the recent nervous selling having been completed. The company is known to be interested in Spain, and it is for this reason that sellers came to market. Perak Electric, at 28s., are a little easier. Tokyo sixes, at 81, have fallen 10s. Palestine A shares at 50s. 3d. are 5s. up. The report, out a few days ago, makes very satisfactory reading. The number of customers and the amount of current supplied each rose in somewhat remarkable fashion. Reading between the lines of the report it may be assumed that there is still plenty of scope for extension of the company's prosperity. Calcutta Electrics, at 57s. 3d., are 1s. 9d. down.

Adelaide Electric Dividend

No little surprise has been created by the action of the Adelaide Electric Supply Company in deferring the payment of the dividend on its preference shares, due September 1st, until a month later. The company has, however, little or no option, for the Commonwealth Government has insisted upon payment of six years' "Absentee" taxes by the preference and ordinary stockholders on the London register. Cheques for the payment of the dividend, due on the preference shares on Tuesday in this week, had been already made out before the Commonwealth demands were formulated. These cheques have had to be scrapped, and a fresh batch prepared, in order to meet the necessities of the case. As far as the future is concerned, it would appear as though most of the shareholders on the London register will not be called upon to pay this additional tax, but by making the requirement retrospective, the Commonwealth Government has succeeded in creating a very unpleasant situation for holders of the shares.

As things stand at present, the Stock Exchange market in the shares has become practically nominal, because, until the figures arrive here in the middle of the month, it will be impossible to tell the amount of retrospective tax applicable to the shares. For some time past the principal buying orders for the preference shares have emanated from the colony. As the tax does not apply to Australian holders of the shares, there will be no question of how much is due from these purchasers.

The Mexican Tragedy

Mr. W. H. Fraser, the general manager of the Mexican Light & Power Company in Mexico City, was shot last week by an ex-employé of the company. The news was received with profound regret by people on this side who knew Mr. Fraser, either personally, or by reputation. From the market point of view, the tragedy has had no effect upon the prices of Mexican utility issues, the prices of which have been, for some time past, more or less dormant.

The American Outlook

The dollar stocks of the American utility companies are making a steady advance in the upward direction, though there is nothing spectacular about the movement. The outlook is deemed to be largely governed by the political possibilities surrounding the result of the Presidential election to be held next November. President Roosevelt, during his term of office, has shown so strong a leaning to the side of Socialism that he has estranged a good deal of support amongst what may be called the investing classes. His Republican opponent, Mr. Landon, professes a more sympathetic attitude towards the claims of capital in industry. His programme contains no such arbitrary limitations of profit-earning capacity as President Roosevelt has supported. Politics apart, American industry is now making satisfactory progress.

Television

After the sharp rise which Baird Television shares experienced last week, as a consequence of the opening of Radiolympia shares came on offer. The deferred shares, from being 9s. 6d., declined to 7s. 6d., while the preferred ordinary fell from 4s. 6d. to 3s. 4½d. The company's issued capital is a little over a million pounds sterling. At the present stage of television, it is probable that Bairds are quoted sufficiently high. People look, however, to the future. As in the case of Electric & Musical Industries shares, the holders expect that the next two or three years will see a substantial advance in the capital value of their interest. E.M.I. shares have reacted a trifle to 23s. 6d., upon a little selling in advance of the dividend announcement.

Miscellaneous Matters

Lancashire Dynamo changed hands up to 60s. 3d. on the idea that there may be a bonus issue. The company's proprietors have sanctioned the creation of 60,000 new ordinary shares of £1 each. Brush ordinary stock, after a rise to 47, reacted to 45½, showing a gain of 4½ points on the week. British Aluminium strengthened to 2⅛, General Electric ordinary to 87s. Crompton Parkinson ordinary have been moving erratically; the price fell at one time to 79s. 3d. from which it rallied to 80s. It would appear as though some of the holders were selling these shares in order to exchange into some of the more popular issues of the day. Henleys at 7⅛ are 2s. 6d. lower. Johnson & Phillips are better by the same amount at 55s. A fair amount of business is going on in the manufacturing and equipment group, although there are few outstanding features. Cable and Wireless stocks are uninteresting. Globe Telegraphs ordinary at 14 are 5s. down.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price. Sept. 1.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	77/6xd.	—	3 17 5
City of London	1	7½	7½	37/-xd.	—	4 1 1
Clyde Valley	1	7	8	46/-xd.	+6d.	3 9 7
County of London	1	10½	10½	54/6	—	3 17 2
Edmundson's 7% Pref.	1	7	7	35/6	—	3 19 0
Do. Ord. ...	1	8	8	45/-	—	3 11 0
Elec. Dis. Yorkshire	1	9	9	47/-	—	3 16 7
Elec. Fin. and Securities	1	12½	12½	3½	—	3 11 5
Elec. Supply Corporation ...	1	11	11	60/9	—	3 12 4
Lancs Light and Power	1	7½	7½	38/-	—	3 19 0
Lond. Assoc. Electric	1	—	7	35/-	—	4 0 0
London Electric	1	7	8	39/6	—	4 1 1
London Power Deb. Red. ...	Stock	5	5	107½xd.	—	4 13 0
Metropolitan	1	10	10	51/-	—	3 18 5
Midland Counties	1	7	7½	41/-	+6d.	3 13 2
Mid. Elec. Power	1	8	8	45/-	—	3 11 1
North Eastern Electric Ordinary	1	6	6	36/-	—	3 6 8
Do. 7% Pref.	1	7	7	36/6	—	3 16 9
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 3
North Met. Elec. Ordinary ...	1	10	10	57/6	+6d.	3 9 7
Do. do. 6% Pref. ...	1	6	6	32/6	—	3 13 10
Scottish Power	1	8	8	42/6	—	3 15 5
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7⅛% Pref.	1	7⅛	7⅛	22/6	+1/-	6 13 4
Yorkshire Elec.	1	8	8	44/-	—	3 12 9
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	116½	—	4 5 9
Do. 1955–75 ...	„	5	5	120	—	4 3 4
Do. 1951–73 ...	„	4½	4½	111	—	4 1 1
Do. 1963–93 ...	„	—	3½	104	—	3 7 4
London Elec. Trans. Gtd. ...	„	—	2½	96	—	2 12 1
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A...	„	—	4½	122½	—	3 13 6
Do. do B...	„	—	5	128½	—	3 17 10
Do. do C...	„	3½	4	106	+1	3 15 6
West Midlands Joint Elec. 1948–68	„	—	5	116½	—	4 5 10
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	174½	+2	5 3 2
Anglo-Am. Tel. Pref.	Stock	6	6	127½	—	4 14 1
Do. Def.	„	1½	1½	32	—	4 13 9
Cable & Wireless 5½% Pref. ...	„	4½	5½	102	—	5 7 10
Do. A. 7½% Ord.	„	Nil	Nil	21⅛	−½	—
Do. B. Ord.	„	Nil	Nil	6½	—	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14	−¼	3 4 4
Do. Do. Pref.	10	6	6	14⅛	—	4 3 6
Great Northern Tel.	10	20	20	46	—	4 7 0
Marconi-Marine	1	10	7½	33/9	—	4 9 0
Oriental Telephone Ord.	1	12*	12*	3½	—	3 13 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	1500	+50	—
Do. do. Pref. Ord.	„	8	8	175½	—	4 11
Brazil Traction	100	—	30 cts	12½	+⅜	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	102½	—	4 17 7
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	45	—	—
Victoria Falls Ord.	1	20	12	3⅞	—	3 1 10
West Riding	1	5	6½	50/-	—	2 12 9
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	65/-	—	4 12 4
Assoc. Elec. Ord.	1	6	8	55/-	—	2 18 2
Do. Pref.	1	8	8	39/6	−6d.	4 1 0
Babcock & Wilcox	1	8	8	50/-	−9d.	3 4 0
British Aluminium Ord.	1	7½	7½	42/6	+1/-	3 10 7
British Insulated Ord.	1	15	20	5½	—	3 11 0
Brush Ord....	Stock	Nil	Nil	45½	+4½	—
Callender's	1	15	15	4½	—	3 6 7
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord. ...	5/-	—	12½	4	−⅛	—
Do. 8% Pref.	1	8	8	2	—	4 0 0
Edison Swan 1st Pref.	1	7½	7½	30/-	—	5 0 0
Electric Construction	1	3½	7	40/-	—	3 10 0
Enfield Cable Ord.	1	25	25	5½	+⅛	4 8 0
English Electric	1	Nil	Nil	26/6	—	—
Do. Do. Pref.	1	Nil.	Nil	27/6	—	—
Ericsson Tel.	5/-	24	20*	2⅛	−⅛	1 17 3
Ever Ready	5/-	35	35	27/6	—	6 7 3
Ferranti Pref.	1	7	7	28/9	—	4 17 5
G.E.C. Pref.	1	6½	6½	35/-	—	3 14 4
Do. Ord.	1	10	15	87/-	+1/-	3 9 0
Henleys	1	30	30	7⅞	−⅛	3 18 8
Do. 4½% Pref.	5	4½	4½	5⅜	—	3 18 3
India-Rubber Preferred	1	—	5½	1⅛	—	4 17 9
Johnson & Phillips	1	7½	10	55/-	+½	3 12 9
Lancashire Dynamo	1	5	10	2⅝	—	3 9 7
Siemens Ord.	1	4	6	32/6	—	3 13 10
Telegraph Construction	£1	Nil	Nil	33/9	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be numbered and abridged and all subsequent proceedings will be taken.

1934

31682. "Cathode-ray tubes preferably for television purposes." Radio Akt.-Ges. D. S. Loewe. November 8th, 1933. (451574.)

34747/8. "Modulated carrier-wave receivers." Marconi's Wireless Telegraph Co., Ltd. December 1st, 1933. (Cognate application 34749/34.) (451345/6.)

34895. "Television systems." Radio Akt.-Ges. D. S. Loewe. December 6th, 1933. (Addition to 445428.) (451578.)

1935

98. "Electric impedance networks." W. P. Wilson. January 1st, 1935. (451494.)

132. "Electrical communicating systems." L. H. Paddle. January 2nd, 1935. (451495.)

134. "Electrical communication systems." L. H. Paddle. January 2nd, 1935. (Cognate application 413/35.) (451496.)

152. "Electric-discharge devices." British Thomson-Houston Co., Ltd. January 3rd, 1935. (451353.)

564. "Art of electric-arc welding." W. R. Hume and Hume Steel Co., Ltd. January 7th, 1935. (451582.)

3080. "Closed containers of galvanic cells, particularly storage batteries." Britannia Batteries, Ltd. (Accumulatoren-Fabrik Akt.-Ges.). January 30th, 1935. (451653.)

3612. "Cathode-ray tubes." Telefunken Ges. für Drahtlose Telegraphie. February 2nd, 1934. (451590.)

3613. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. February 2nd, 1934. (451358.)

3629. "Telephone systems and automatic switches for use therein." Automatic Electric Co., Ltd., R. Taylor and G. T. Baker. February 4th, 1935. (451362.)

3744. "Armouring of the lead sheaths of electric cables subject to internal pressure." Cablon, Ltd. February 5th, 1934. (451655.)

3765. "Prepayment meter mechanism." English Electric Co., Ltd., and G. Tilstone. February 5th, 1935. (451423.)

3843. "Automatically reclosing electric switches or circuit-breakers." English Electric Co., Ltd., and A. A. Heath. February 6th, 1935. (451596.)

3850. "Electric-discharge devices." British Thomson-Houston Co., Ltd., and F. P. Whitaker. February 6th, 1935. (451508.)

3899. "Electric batteries." Ever Ready Co. (Great Britain), Ltd., and A. H. Sheppard. February 6th, 1935. (451511.)

3903. "Telephone systems." Automatic Electric Co., Ltd., R. Taylor and G. T. Baker. February 6th, 1935. (451512.)

4044. "Cable connectors for electrical distribution systems, specially applicable for neutral cable connections of switchboards, street boxes and the like." Castle Fuse & Engineering Co., Ltd., and E. J. Morley. February 8th, 1935. (451427.)

4102. "Circuit arrangement for vacuum tubes." Standard Telephones & Cables, Ltd., W. T. Gibson, D. H. Black and W. Lawrence. February 8th, 1935. (451661.)

4103. "Thermionic vacuum tubes." Standard Telephones & Cables, Ltd., W. T. Gibson, D. H. Black and W. Lawrence. February 8th, 1935. (451662.)

4127. "Television and like systems." J. C. Wilson & Baird Television, Ltd. February 8th, 1935. (451663.)

4142. "Loudspeakers." British Thomson-Houston Co., Ltd., and J. Moir. February 8th, 1935. (451664.)

4183. "Automatic switches for use in telephones or like systems." Automatic Electric Co., Ltd., R. Taylor and G. T. Baker. February 8th, 1935. (451667.)

4204. "Wireless television method and arrangement." Radio Akt.-Ges. D. S. Loewe. February 9th, 1934. (Cognate application 4205/35.) (451670.)

4206. "Magnetic correction of cathode-ray tubes." Radio Akt.-Ges. D. S. Loewe. February 9th, 1934. (451604.)

4238. "Galvanic batteries." A. Swan. February 9th, 1935. (451671.)

4401. "Sound transmitting, recording and producing systems." Marconi's Wireless Telegraph Co., Ltd. February 9th, 1934. (451676.)

4805. "Gas-blast electric switches." British Thomson-Houston Co., Ltd. February 14th, 1934. (Addition to 451233.) (451431.)

5072. "Electric traction and like control systems." R. Brooks, W. T. Gray, and Associated Electrical Industries, Ltd. February 16th, 1935. (451514.)

6163. "Electric switches provided with arc-quenching means." British Thomson-Houston Co., Ltd. February 26th, 1934. (451434.)

6545. "Methods of and means for locating earth faults on overhead electric power-transmission lines." T. R. Warren. March 1st, 1935. (451288.)

6885. "Controlling the signal frequencies in television systems." I. L. Maguire. March 6th, 1934. (451610.)

7338. "Electrical connectors or switch contacts of the plug-and-socket type." General Electric Co., Ltd., and H. J. Coates. March 8th, 1935. (451292.)

7832. "Automatic pipe or electric couplings for rail and like vehicles." Knorr-Bremse Akt.-Ges., W. Kaiser and H. Balke. March 13th, 1935. (Addition to 434241.) (451521.)

8257. "Dynamo-electric machines." A. G. Williamson and Metropolitan-Vickers Electrical Co., Ltd. March 16th, 1935. (451443.)

9137. "Apparatus responsive to the phase difference between two voltages." British Thomson-Houston Co., Ltd. March 23rd, 1934. (451618.)

9970. "Devices for the decomposition or recomposition of pictures, particularly for purposes of television." E. Traub. March 30th, 1935. (451297.)

10317. "Jack assembly for telephone and other electrical purposes." Siemens Bros. & Co., Ltd., and W. E. Goodwin. April 3rd, 1935. (451298.)

10428. "Electric lampholders and like electrical couplings." J. Barlow. April 4th, 1935. (451446.)

10965. "Alternating-current electric motors of small size." A. Horstmann and Horstmann Gear Co., Ltd. April 9th, 1935. (451447.)

13325. "Junction boxes." W. T. Henley's Telegraph Works Co., Ltd., and J. F. Stone. May 4th, 1935. (451302.)

15069. "Cathode-ray tubes and methods of manufacturing the same." Marconi's Wireless Telegraph Co., Ltd. June 2nd, 1934. (451451.)

15511. "Electric wave filters." Standard Telephones & Cables, Ltd. (E. L. Norton and R. L. Dietzold). May 28th, 1935. (Convention date not granted.) (451527.)

15514. "Electrical distribution boards for use in feeder pillars or the like." W. T. Henley's Telegraph Works Co., Ltd., and E. Moor. May 28th, 1935. (451454.)

15665. "Cathode-ray tubes." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. June 13th, 1934. (451303.)

15937. "Trolley heads for electrically propelled vehicles." Morgan Crucible Co., Ltd., and A. G. A. Colbeck. May 31st, 1935. (451380.)

17687. "Electromagnetic switches of the type used in telephone systems." General Electric Co., Ltd., and J. Eriksen. June 20th, 1935. (451534.)

17930. "Electron discharge device amplifiers." Marconi's Wireless Telegraph Co., Ltd., and O. E. Keall. June 21st, 1935. (451535.)

19276. "Glasses for telegraph insulators and the like." General Electric Co., Ltd., and J. H. Partridge. July 5th, 1935. (Addition to 426129.) (451308.)

20264. "Electrically heated water reservoirs." T. Stiebel. July 16th, 1935. (451309.)

21649. "Apparatus for use in medical treatment by means of short electric waves." V. Tomberg. July 30th, 1934. (451310.)

21759. "Electric culinary ovens." A. Walterspiel. July 31st, 1935. (451383.)

22480. "Electrical wave filters." Electrical Research Products, Inc. August 16th, 1934. (451633.)

24472. "Rectifying valves and circuits." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 11th, 1934. (451542.)

27009. "Mobile sound reproducing apparatus." Marconi's Wireless Telegraph Co., Ltd. October 31st, 1934. (451387.)

31306. "Means for operating electric eddy-current furnaces." Allmänna Svenska Elektriska Aktiebolaget and L. Dreyfus. November 12th, 1935. (451473.)

31435. "Devices for charging electric condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 6th, 1934. (451319.)

31573. "X-ray installations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 6th, 1934. (451320.)

31574. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 11th, 1935. (451474.)

32042. "Train control means for toy electric trains." E. P. S. Newman. November 19th, 1935. (451397.)

32394. "Safety devices for elevators." Waygood-Otis, Ltd. June 15th, 1935. (451398.)

34101. "Apparatus for predetermining in an electrical installation with maximum demand tariff the consumption of energy likely to occur at the end of a measuring period." Landis & Gyr Akt.-Ges. December 27th, 1934. (451324.)

35367. "Rectifying circuits containing an ionic valve." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 30th, 1935. (451635.)

36008. "Adjustable inductances." E. Michaelis. December 28th, 1934. (451565.)

1936

443. "Electrical plugs." United States Rubber Co. January 5th, 1935. (451566.)

2405. "Electric furnaces." British Thomson-Houston Co., Ltd. January 25th, 1935. (451484.)

4782. "Oscillation generator arrangements." Marconi's Wireless Telegraph Co., Ltd. February 16th, 1935. (451568.)

6263. "Means and method for modulating high-frequency currents." Farnsworth Television Inc. March 13th, 1935. (451645.)

7037. "Illuminating appliances." Holophane, Ltd. March 19th, 1935. (451332.)

7692. "Cable distributors more especially for television cables." Siemens & Halske Akt.-Ges. March 16th, 1935. (451333.)

8134. "Electric motors." British Thomson-Houston Co., Ltd. March 27th, 1935. (451569.)

10958. "Machines for coiling wire." British Thomson-Houston Co., Ltd. April 16th, 1935. (451570.)

11695. "Electric accumulators." H. Dean and Chloride Electrical Storage Co., Ltd. April 24th, 1936. (451572.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 26th:—

Claudgen. No. 569410. Class 8. Electric discharge lamps, not for curative or surgical purposes, and not being ordinary incandescent lamps.—Claude-General Neon Lights, Ltd., Pitman House, Parker Street, Kingsway, W.C.2.

Farrex. No. 569878. Class 8. Wireless telegraphic and telephonic apparatus.—Robert Donovan Farrant, trading as Farrex Radio, 543, Holloway Road, N.19.

Matador. No. 570302. Class 8. Instruments and apparatus and parts thereof for use in connection with wireless telephony and telegraphy and television.—Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.

Teralc (lettering and design)). No. 570294. Class 8. Instruments, apparatus and parts thereof for use in telephony, telegraphy and wireless telephony and telegraphy.—Lucien Claret, 57, Avenue Anatole France, Colombes, Seine, France. (British representatives: Tongue and Birkbeck, 329, Bank Chambers, High Holborn, W.C.2.)

Saturex. No. 570574. All goods in Class 8.—Alan Stewart Fitzgerald, Wynnewood, Penn., U.S.A. (British representatives: Baron and Warren, Thanet House, 231, Strand, W.C.2.)

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Amersham.—Houses (75), for the R.D.C.; Kemp & How, architects, 4, Bloomsbury Square, London, W.C.

Ashton-under-Lyne.—Houses (344); borough surveyor.

Barnard Castle.—Houses (30); R.D.C. surveyor.

Birmingham.—Additions to Ansells Aston Brewery, Ltd., Aston Cross (electrical work); Maddocks & Walford, builders, Erdington. Factory, Great Barr Street, for Wright's Rope Works, Ltd. (electrical work); Maddocks & Walford, builders.

Blackburn.—Houses (75); A. Greenhalgh, builder, 66, Wigan Road, Bolton.

Bolton.—Extensions, Townleys Hospital; borough engineer.

Bordon.—Cinema; South Down Cinemas, Ltd., 2, Rugby Road, Southampton.

Bournemouth.—Development, Great Oak Nursery estate; Great Oak Estate Co., Ltd. Estate developments, Haverstock Road and Petersfield Road; Fox & Sons.

Bradford.—Extensions; J. Newbould & Sons, Ltd., Dick Lane. Works and offices; A. Southern & Co., Ltd., Woodhead Lane.

Bridlington.—Library (£6,050); borough engineer.

Cardiff.—Extensions to works, Penarth Road; Dixons Cardiff & South Wales Ropeworks, Ltd.

Chadderton (LANCASHIRE).—Bath reconstruction (£21,300); U.D.C. surveyor.

Chelmsford.—Business stores, High Street; Montague Burton, Ltd., Leeds.

Chester.—Garage to accommodate 30 buses (electrical work); Crosville Motor Services of Chester.

Clowne (DERBYSHIRE).—Bungalows (70); R.D.C. surveyor.

Cosford (SUFFOLK).—Houses (86); R.D.C. surveyor, Bildeston.

Coventry.—Offices, Hertford Street (electrical work); Chas. B. Odell & Co., estate agents, 53, Hertford Street. Church (electrical work); A. Matts & Son, builders.

Crewe.—Cinema; D. Forrester, Cross Street, Manchester.

Croydon.—Flats and maisonnettes; borough engineer.

Darfield (YORKS).—Houses (47), Balkley Lane, for New Lodge Estate Co.

Darlington.—Premises for Doggarts, Ltd., Northgate; G. Baines & Son, architects, 121, Victoria Street, London, S.W.1.

Dumbarton.—Premises, High Street; Dumbarton Equitable Co-operative Society, Ltd.

Dunblane.—Reconstruction, at a cost of £30,000, of Dunblane Hydro (including cinematograph installation, bathing pool, &c.); T. Scott Sutherland, architect, Aberdeen.

Durham.—School, Bleach Green, for C.C.; F. Willey, county architect, 34, Old Elvet, Durham.

East Suffolk.—Extensions, county offices, and hospital at St. Andry. Also construction of children's homes at Lowestoft and Stowmarket; county architect, Ipswich.

Edinburgh.—Cinema (£24,000) at Pilton Drive; J. Miller and Partners, Ltd., builders, 88, Hanover Street. Nurses' home for the Royal Edinburgh Hospital and Asylum; governors.

Epsom.—Fire station and quarters, Church Street; U.D.C. surveyor.

Felixstowe.—Cinema and shops, Hamilton Road; R. Cromie.

Glamorgan.—Houses (21), Flemington, for County Council; county surveyor, Cardiff.

Harrogate.—Extension to Bramhope Children's Home, &c.; G. H. Herring, architect, 21, Milton Road, Harpenden, Herts.

Hunts.—Nurses' home, Three Counties Mental Hospital; county architect.

Irish Free State.—(NAAS, Co. KILDARE).—Houses (62); A. K. Sargent, architect, Kill, Co. Kildare.

Lancashire.—Junior school, Sheepfoot Lane, Prestwich; Education Committee, Preston. Hospital (1,000 patients) and institution for 2,000 mentally defectives, for Lancs Mental Hospitals Board; County offices, Preston. Dental clinic, Elletson Terrace, Preesall; county surveyor, Preston.

Laurencekirk.—Municipal offices; burgh surveyor.

Leeds.—Premises, Boar Lane; Leeds Industrial Co-operative Society.

Leek.—Houses (70); H. Sleigh & Co., Shoebridge Street.

Lincoln.—Extensions to technical college (£10,113); Education Committee.

Lincolnshire.—High School (£35,861) for Lindsey C.C.; T. F. Trower, architect, "Elsom House," Broad Street, Spalding.

London.—(NEW ELTHAM).—Station (£20,000), with shops, for the Southern Railway Co., Ltd.; chief engineer, Waterloo Station.

Luton.—School, Dunstable Road; Education Committee.

Macclesfield.—Branch Co-operative Stores, London Road, for the Macclesfield Equitable Provident Society, Ltd., 32, Park Green; Gorton & Wilson, builders, Elizabeth Street. Cinema; Drury & Gomersall, architects, Manchester.

Manchester.—School, Bowker Vale; G. & W. Smith, Ltd.

Middleton St. George.—Cinema, electrical work; Carter Crowe, Newcastle-on-Tyne.

Milnrow.—Houses (44), Holt estate, for U.D.C.; A. Travis, architect, Newmarket Chambers, Yorkshire Street, Rochdale.

Nechells.—Factory, Argyle Street, for Messrs. J. Booth & Co. (1915), Ltd., Birmingham; Rowbotham & Sons, builders, Coventry Road, Birmingham.

Newcastle-on-Tyne.—Baths, Fenham; Mauchlen & Weightman, architects, 1, Collingwood Street. Library, Fenham; R. G. Roberts, 18, Cloth Market. Baths, Jesmond; Hetherington & Wilson, architects, 52, Westgate Road. Child welfare and maternity centre, St. Anthony's Road, for the City Council; R. G. Roberts, city architect, 18, Cloth Market. Houses, Newton Park estate; Marshall & Tweedy, architects, Mervyn House, 129, Pilgrim Street. Shops, Sutton Street; A. Anderson, Ltd., builders, Sutton Street. Warehouse, Bells Court, for F. Gascoigne & Co.; S. H. Lawson, architect, Emerson Chambers. Garage and dwelling house in Ouse Street; R. Ranken & Sons, Ltd., transport agents, 77, Quayside. Houses (30), Coast Road area; H. R. Atkinson, builder, Martella Gardens. Houses (12), Bexley Avenue; Longstaff & Bain, builders, Denton Road. Conversion of St. James's Boxing Hall, St. Andrew's Road, into a cinema; E. M. Lawson, architect, Barras Buildings, Barras Bridge. Showrooms, Pudding Chare, for R. Wooster, cabinetmakers; J. N. Fatkin, architect, 17, Bigg Market. Hotel, West Road, for Archibald Arrol & Co.; Elliott Brothers, builders, Otterburn Terrace.

Newcastle (STAFFS).—Reconstruction of Pavilion Cinema and extension of Regal Cinema (£40,000); Hollins & Jones, architects.

Newent (GLOUCESTERSHIRE).—Houses (70), Watery Lane, for Wildsmith & Hurrell, Gorsley.

Northampton.—Houses (198), Spencer estate; R. A. Winfield, borough engineer's department.

Northumberland.—Schools at Forest Hall, &c.; county surveyor, Newcastle-upon-Tyne.

Norwich.—Water mains (£53,726); city engineer.

Oldham.—Houses (66), Long Lane estate; Wm. Chappell & Sons, Ltd., builders and contractors, Chappell Road, Droylsden.

Perth.—Houses (120) for Perth Housing Association, Ltd., 75, George Street.

Prescot.—Houses (142), Windy Arbor Road, Whiston; W. J. Fraser, The Arcade, Lord Street, Liverpool.

Rochdale.—Refuse depôt (£22,750), Entwistle Road; borough engineer.

Sale.—Houses (150), Legh estate, Northenden Road, Sale Moor; Mauldeths, Ltd., builders, 65, Langdale Road.

Salford.—Baths, Broughton; city engineer.

Sheffield.—Factory, Coleford Road; Cooper Bros. Aerodrome, Todwick (£200,000); city engineer. Flats (112), Duke Street; M. Malthouse, Ltd. Houses (20), near Abbeydale Road; Auckland and Bromhead. Houses (24), Handsworth Avenue; W. & E. Sadler, Ltd. Houses (52), Dransfield Road; W. Barlow. Nurses' home, Brunswick Street; Jewish Hospital for Women.

Shrewsbury.—Houses (120), Wingfield Close; A. W. Ward, borough surveyor.

South Ferriby (LINCOLNSHIRE).—Cement works (£250,000 to £300,000), for the North Lincolnshire Portland Cement Co., Ltd.; secretary.

Southport.—Development of 21-acre site for Hesketh Estates, Ltd.; Duncan B. Gray & Partners. Public buildings, Woodlands site (£79,778); S. N. Cooke, architect. Reconstruction of Public Assistance offices, Birch Street; borough engineer.

Stirling.—Alterations and additions to offices for Scottish Central Electric Power Co.; D. W. Glass, architect, Dumbarton Road.

Stornoway.—Extensions, Lewis Hospital (£18,000); governors.

Stourbridge.—Additions to the Hayley Green Hospital (electrical work); Folkes & Folkes, architects, 34, Hagley Road.

Stratford-on-Avon.—Cinema, cattle market site (£30,000); R. Satchwell, architect, 6, New Street, Birmingham. Premises, Bridge Street, for Montague Burton, Ltd., of Hunslet Road, Leeds; W. & A. Forsdike, Ltd., builders, St. Mary's Road, Sheffield.

Sunderland.—Bacon factory (£30,000); W. & T. R. Milburn, architects, 17, Fawcett Street.

Surrey.—Junior school, West Molesey; County Education Committee, Kingston-on-Thames.

Tenterden (KENT).—Cinema; Fassnidge, Son & Norris, Ltd., builders, Uxbridge and Ascot.

Thurrock.—Offices; G. F. Angrassy, U.D.C. surveyor, Palmers Avenue, Grays.

Wallsend.—Church hall; J. Jackson & Sons, builders, Corporation Street, Newcastle.

Walsall.—Houses (2,000), near Aldridge Road and Lockwood Canal, for B. A. Featherston-Dilke, Maxstoke Castle, Coleshill, Coventry; Couchman & Steeds, architects, 25, New Street, Birmingham, 2. The scheme includes a shopping centre, cinema and construction of new roads. School, Bell Lane; J. Taylor, borough engineer. Premises, Coalpool, for Butler & Co., Springfield Brewery, Wolverhampton; Farmer & Farmer, architects, 57, Colmore Row, Birmingham.

Ware (HERTS).—Houses (32), Musley Common site; U.D.C. surveyor.

Warrington.—Offices, Golborne Street and Regent Street, for Gittens & Cook. Cinema, Buttermarket, for Odeon Theatres, Ltd.; H. W. Weedon, architect, Birmingham.

Warsop.—Cinema (£10,000), electrical work, for Warsop Theatre Co., Ltd.; Adam Eastwood & Sons, builders.

Wednesbury.—Central clinic (£20,000), electrical work, and police court; borough surveyor.

Wellington (SHROPSHIRE).—Houses (84), Donnington, for the R.D.C.; Eadie & Co., builders, Wolverhampton.

Wetherby.—Houses (40), for the R.D.C.; T. W. Outram & Son, builders, Rotherham.

Willesden.—Factory; Messrs. G. Kemp, Ltd.; cement manufacturers, London, N.W.2. Factory; Non-Ferrous Diecasting Co., Ltd., N.W.2.

Workington.—Houses (100), Frostoms estate; R. Leslie. Houses (84), Council estates; borough engineer.

Worsley.—Factory (6,000 employés); Montague Burton, Ltd.

Worthing.—Flats, Guildford Road estate; C. Green. Houses (30), Stone Lane, for Boxall & Stracey; H. M. Potter, architect. Stores for Brighton Co-operative Society, Chapel Road and Teville Road; Bethell & Swannell, architects.

Wortley (SHEFFIELD).—Houses (44), for R.D.C.; W. Insley, builder, Grenoside.

Yorkshire.—School (360 places), Horbury, for West Riding E.C.; director of education, Wakefield. Extensions to the county hall for North Riding C.C.; county architect, Northallerton.